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The Massachusetts Medical Society

A HANDBOOK FOR HEALTH EXAMINATIONS BY PHYSICIANS

Prepared for the Committee on Public Health of the Massachusetts Medical Society

BY JOSEPH GARLAND, M.D.

CHAPTER I

Introduction

THIS book on the health examination has been prepared, not as a text book of diagnosis or treatment, of which a number are always current, nor as an exposition of any new specialty in medicine, but simply as a description of the generol technique of such examinations for the general practitioner whose function it should be to perform them.

The whole evolution of medical practice has in the main centred on one function for the physician—that of caring for the sick. It has been his lot to cure rarely, to comfort often, but seldom to prevent, unless it should be in the prevention of complications to a condition that already exists.

It has taken many generations of practice in the art of medicine and much keen investigation into the hidden sources of disease to give us a realization of how some illnesses may be prevented. We know almost absolutely how to prevent certain specific conditions: diphtheria, typhoid fever, smallpox, alcoholic cirrhosis; and we know in general the modes of living that should be adopted in order to give us the best possible chance of maintaining a state of health in which we are less likely to contract disease than if such rules were disregarded. Such instruction to his patients should come in the province of the general practitioner.

We know, moreover, that by periodic careful physical examinations, with a standard of normality well in mind, the beginnings of certain diseases or tendencies toward them may be detected while they are still curable or preventable. Here again the family physician finds for himself a place in the practice of preventive medicine that can be filled by no one else.

Preventive medicine and health preservation have but recently become accepted functions of the art and science of medicine as a whole. We are viewing with ever increasing respect the achievements of health foundations and public health departments. Industrial medicine has claimed a field of its own, and the full or part time industrial physician has created for himself a position in which he demands and deserves the esteem of his fellow workers in other and older branches of medicine. Preventive medicine will hold in the future a place equal in importance to therapeutic medicine, and he who does not add it to his duties will lag behind the rest of the profession.

Preventive medicine has so far been a mass activity; that is, it has largely been applied as a public health measure or to groups of individuals occupied in the same industrial activities. Special problems were therefore presented and as a result, and quite rightly, it came to be considered as a definite specialty. Preventive medicine as a mass activity is a definite specialty; preventive medicine as applied to the individual is very definitely not a specialty, and its development will be seriously handicapped if it comes to be considered as such. It must very decidedly come to be considered as one of the functions of the family physician, trained in the art of medicine, equipped by his training for just such a duty, and peculiarly fitted for its performance by the relationship which he bears to his patients.

This text, therefore, is not designed in any sense to introduce a new specialty to the profession; it must be considered only as a convenient handbook to assist the general practitioner in the performance of adequate health examinations. Its only object is to encourage him to perform such examinations, to refresh his memory on various points in physical diagnosis, to bring before him a few standards of normality, and to establish a general technique which may be of value to him when he accepts this obligation.

The conception of a thorough physical examination may vary from a highly technical procedure, consuming many hours of time and involving specialized clinical and laboratory examinations, to a simple investigation including an intelligent history-taking, a careful examination of the patient, and certain routine laboratory tests. Such an examination should give a very fair idea of the general state of health of the patient and should give indications of any condition that might require further or more specialized study. No single

individual is capable of performing the entire examination first mentioned, whereas the average well trained physician is entirely equipped to carry out the second. In case further study seems indicated it can generally be arranged to have some competent consultant see the patient for specialized investigations.

At the outset it should be recognized by the practitioner that the health examination is a function separate from that of routine practice. A special task is being performed and a special fee should be charged with the full understanding of the patient, and commensurate with the time consumed, and the fact must be appreciated that more time should be consumed by such an examination than by a routine or perfunctory one. Generally speaking, at least an hour must be allowed and the interview should not be crowded into office hours but should be provided for by a special appointment. The advisability of periodic reëxaminations should be impressed upon the patient, and these also should be made by appointment. Ordinarily yearly reëxaminations are to be advised except in the event of positive indication for more frequent subsequent visits. If conditions found on the first examination should require a more lengthy interview with the patient than the allotted time permits, a subsequent visit should also be arranged for such an interview.

Unfortunately, one of the most difficult tasks for the examining physician will be to fix to his own satisfaction standards of normality in health and normal limits of deviation from them. Our previous conceptions of standards of normality have been based largely on standards of pathology on which we have hitherto centred our studies. Pathology is an interesting and illuminating study, but physiology is certainly its equal in importance.

A few notable achievements have been recorded in our progress towards the determination of normal standards of physical well being, but the very facts that have been ascertained throw into prominence the questions that are left unanswered. The boundaries between health and disease are not sharply defined and the differentiation between functional and organic disturbances is not easily made. Organic conditions of a serious nature, as we know, are often so insidious in their onset as to be practically undiscoverable, and functional conditions may be so severe in their nature as to incapacitate the individual. Beyond this we do not know their importance, although we suspect that they do not ordinarily curtail life.

Much experience, of course, has come to those performing life insurance and army examinations, and considerable valuable knowledge has been gained. In neither case, however, has there been any great opportunity to follow up for a considerable length of time the rejected applicants and to determine how sound were the causes of their rejection. At various universities large groups of young men have been carefully investigated and followed up, and many interesting facts have been brought to light that give us a much clearer idea of some of the standards of normality, for this age group at least. Of particular value has been the awakened appreciation of some of the effects of general nervous instability and the association of these functional derangements in the same individual. Thus poor bodily mechanics, albuminuria, tachycardia, unstable blood pressure, and often systolic cardiac murmurs may be found in the same type of individuals, and generally speaking these may be said to represent the type most frequently developing cardiac "effort syndrome" although without organic defects.

Our limitations are manifest but experience will broaden our horizon and bring us new concepts as to health standards. Our purposes will be threefold as designated by Dr. Roger I. Lee before the Massachusetts Medical Society in 1923: "(1) The detection of organic pathology, to be followed by the necessary measures for the correction, compensation, or control of the lesions discovered, as far as possible. (2) The detection of non-organic functional disturbances, to be followed by the necessary measures for the correction, compensation, or control of these disturbances, as far as possible. (3) The evaluation and classification of each individual as an entity, to be followed by direction as to suitable future activities and by measures designed to better his classification and thereby improve his well-being and enlarge his potential activities."

RECORDS

The advisability of keeping adequate and permanent records of health examinations is obvious. The size, fullness, and form of such records must, however, be a matter of individual choice. The Committee on Health Examinations appointed by the President of the Massachusetts Medical Society in 1924 dealt briefly with this subject in its report and submitted a specimen record form, recognizing that any form adopted must be capable of incorporation into the physician's existing record system. The appended simple form modelled after that of the committee need be accepted only as a suggestion.

Various individuals and various agencies undertaking the performance of physical examinations have devised elaborate and inclusive forms for the recording of data. Many of these forms are so elaborate that important facts are buried in a mass of non-essential ones. The simpler a form is the greater is the likelihood that it will be carefully considered in the recording of important data. The danger in

PHYSICAL EXAMINATION RECORD

HISTORY

Name Address

Date Occupation

Family History

Social and Marital History

Previous History

Habits

Recreations

Accidents

Operations

Women:

Present Status

PHYSICAL EXAMINATION

Age: Yrs. Mos. Height: With Without shoes Weight: With Without clothes

Color General Appearance

Posture Feet Shoes

Eyes: R L Glasses: R L When examined

Mouth

Throat

Nose

Ears Hearing

Heart

Pulse rate B. P.

Lungs

Abdomen

Hernia Genitalia Hemorrhoids

Varicose veins Glands

Urine: Color Sp. gr. Reaction Alb. Sug. Sediment

Hgb. Wassermann reaction

Summary

Advice

all such forms is that of too slavish adherence to the suggestions conveyed by the headings causing the examiner to disregard very important facts that may not be so suggested. Such forms often lack space for the recording of facts which might require amplification.

On the whole, however, a simple but generally understandable and well devised form is an asset to the examiner who wishes to complete his examination with moderate dispatch and record his findings according to some standardized system. The specimen form recommended by the committee seems well adapted to the needs of the busy practitioner, as does the suggestion of the committee that the most desirable form is upon a standard card with a fly leaf duplicate and carbon paper between, enabling the physician to make two records with one writing, one for his file, and the other for the patient if he chooses. Space should be provided on the same or another card for reëxaminations or follow-up data.

CHAPTER II

The History

The health history of the patient takes equal rank in importance with the actual physical examination. Regardless of how briefly the information obtained may be recorded, a careful history should never be neglected. This should be classified roughly under four headings: The family history, the previous history, habits, and present status. The present status of a presumably healthy person or the present illness of a sick one contains the reason why the patient sought the advice of the physician, and it is a matter of common knowledge that this information, always uppermost in the mind of the patient, is often entirely lost sight of in the details of a complete and elaborate history.

History Forms. It is often an irritating and always a time-consuming process to elicit an adequate and systematic history from a patient. For this reason some physisicans who purpose to do a considerable volume of health examination practice may find it advisable to prepare complete history blanks which may be studied and carefully filled out by their patients before they come for examination. With such blanks only a moderate amount of further interrogation on the part of the physician may be necessary. The value of such forms lies only in the time they may save the physician and they must be considered in no way as an essential part of the health examination equipment.

General Data. The history should be headed by such obvious facts as the age, birthplace, and occupation of the individual, and the number of years spent in the United States, if of foreign birth.

FAMILY HISTORY

The family history should include the ages and state of health of parents, brothers and sisters, husband or wife and children, as well as the causes of and ages at death of those not living. Cancer, tuberculosis, and insanity are the most important diseases of which it is advisable to know in the family history.

OCCUPATIONAL HISTORY

The occupation of any individual may comprise one of the most important factors bearing on his state of health. Not only is it important to know of the recognized industrial hazards inherent in such occupations as painting, metal working, and stone cutting, but in general constant exposure to various dusts, poor ventilation, inadequate light, and mental strain may directly influence physical well-being.

PREVIOUS HISTORY

Past Illnesses. The previous history should first of all include a statement of all diseases of any importance that the individual has suffered from. Such a list generally starts with the contagious diseases of childhood and is of value partly because it gives an indication of the natural immunities that the patient has probably acquired, and partly because of such later complications as nephritis and rheumatic heart disease that may be associated with some of them, such as diphtheria and scarlet fever. Other infections of the rheumatic group—tonsillitis, rheumatic fever, and chorea—should be inquired into, and previous attacks of typhoid fever, malaria, smallpox, pneumonia, pleurisy, influenza, otitis media, gonorrhoea, syphilis, and convulsions should be made a matter of record.

Operations. The character of any operations and the ages at which they were performed and any serious accidents should be known. In this section of the history information should be included as to eyesight and the use of glasses, and the care of the teeth, including the frequency of visits to the dentist.

HABITS

The habits of the individual may be inquired into as part of the information relating to Present Status, or they may be taken up separately under a separate heading. In either event it is well to know of the manner of life of the patient, whether in a lodging-house or at home with a family in an apartment or house. It is always advantageous, in order to gain a clear concept of the individual and the mental and physical influences that may be bearing on him, to know as much as possible concerning his social environment.

Diet. The examiner should enquire closely into the type of meals eaten, the time allowed

for eating, the regularity of meal hours, the number of meals eaten at home and in restaurants, and the type and amount of food consumed between meals. It is not difficult for the examiner and may be enlightening to him to secure a description of the average diet for each of the three meals of the day. Little in the whole examination, in fact, will give him more opportunity for constructive advice than in the matter of the diet and the manner of eating it. While on the same general subject information should be obtained as to the quantities of tea, coffee, milk, water, cocoa, or chocolate consumed during the day, and the past and present use of alcohol and tobacco.

Sleep and Exercise. The amount and character of sleep and ventilation of the bed chamber, the amount and kind of exercise, and the frequency and character of bathing should be matter of knowledge to the physician. In some cases it may be of value to know the sex habits of the individual.

PRESENT STATUS

The Present Status of the patient is the part of the history that concerns him most deeply and he should be given the opportunity of telling his own story concerning it. Such a narrative must be supplemented, however, by leading questions from the examiner. These questions should include in some detail the anatomic and physiological divisions of the body, and where necessary even greater detail should be required.

Head. The frequency, duration, and type of headaches or their absence should be noted, and whether or not they are associated with vomiting, constipation, eye strain, fatigue, or head colds. The frequency and duration of colds may lead in itself to the suspicion of foci of infection in throat or sinuses. Disturbance of vision may be due to simple ocular trouble or may be associated with nephritis, diabetes, toxic conditions, or migraine. Any trouble connected with the ears, such as impaired hearing, pain, tinnitus, or otorrhoea, should be known, and leading questions should be asked in regard to the teeth, buccal cavity, and throat. In most of these matters, of course, a negative answer to a general question may preclude further questioning.

Cardio-Respiratory. The cardio-respiratory history should always be covered in sufficient detail to prevent the omission of important symptoms. A chronic cough may be due to tobacco or other local irritation of the throat, or it may be due to serious pulmonary or cardiac affection. The brassy cough of aneursym and the winter cough of chronic bronchitis are common text-book pictures; pressure on trachea, larynx, or recurrent laryngeal nerve from any cause may produce a cough, and so may pulmonary pathology of many types. If a positive history of cough of any duration is obtained, it is essential to know whether or not the cough is productive, and the type of sputum produced, whether the copious purulent and foul sputum of pulmonary abscess, or the more tenacious, mucopurulent type associated with tuberculosis. Any symptom leading to a suspicion of pulmonary tuberculosis should be followed by inquiry as to hemoptysis, loss of weight, increased fatiguability, afternoon temperature, and night sweats—in general, except for hemoptysis, the symptoms of any chronic infection, of which tuberculosis is still the most common.

A few questions will generally eliminate cardio-vascular disease or give rise to suspicions that will demand confirmation. Where any abnormal shortness of breath exists, cardiac disease must be ruled out before the blame may be placed on any other factor. The amount of difficulty experienced in walking up one or two flights of stairs is often a useful criterion in establishing the presence of abnormal dyspnoea on exertion. The dyspnoea may be due to obesity, lack of exercise, anemia, or chronic bronchitis with emphysema, or it may be due to tuberculosis, to functional effort syndrome of an organically sound heart, or to true heart disease. Palpitation and precordial pain may serve to direct the attention still more forcibly to the cardio-vascular system, and orthopnea often gives striking evidence of a poorly functioning heart. Dyspnoea, however, is not necessarily a concomitant symptom of serious heart disease, for in heart disease of the anginal type, dyspnoea may be lacking, as may all other symptoms except the occasional attacks of vise-like precordial pain, often extending down the left arm in classical fashion. Even this symptom may be lacking and the only one that first arouses suspicion may be a vague gastric distress or indigestion, devoid of a dietary factor, but often closely associated with fatigue or excitement.

Evidence pointing quite strongly towards the cardio-vascular system as the offending one will, of course, naturally bring to mind the possibility of cardiac or nephritic edema, and some effort will be made to determine whether or not the patient has noticed swelling of the ankles. Edema of the ankles is not necessarily either cardiac or renal in origin, for it may be due to varicose veins or hypostasis in a muscularly inactive person who remains long on his feet; but properly evaluated and taken in conjunction with other evidence it may furnish strong proof in favor of beginning heart failure of the congestive type.

Gastro Intestinal. The individuals are comparatively rare who will give strictly negative answers in gastro-intestinal history. The appetite must be known, and the regularity of the bowels, and with a lack of any digestive disturbance this tract may be disposed of. Any

history of indigestion, however, may mean much or little, and always requires further analysis. Pain is important, its character, relation to meals and location, for it may indicate peptic ulcer, cancer of the stomach, pancreas, sigmoid, or rectum, or gall-bladder disease, the gastric crisis of syphilis, lead poisoning, or simple hyperacidity or visceroptosis. If epigastric, it generally refers to the stomach, gall-bladder, or duodenum; if below the umbilicus, it is generally related to the colon. Definite association with meals after a longer or shorter rest period suggests at least the possibility of ulcer. Relief by soda or food is further evidence in this direction. The presence or absence of vomiting is important, and the character and quantity of the vomitus, and whether or not associated with hematemesis. Old or fresh blood in the stool is always of great significance. It would be idle, of course, to attempt even the briefest analysis of abdominal symptoms. It is sufficient to point out a few of the possibilities and emphasize the care that must always be taken in constructing a history based on symptoms referable to the gastrointestinal tract.

Genito-Urinary. The genito-urinary tract may also be dismissed briefly if negative answers are obtained to a very few simple questions, or it may require a more detailed investigation as the result of positive answers. Whether or not the patient has regular nocturia should always be learned, for on this symptom may depend the diagnosis of nephritis or an obstructing prostate. Polyuria and frequency with increased thirst are suggestive of diabetes; frequency with burning or painful micturition is suggestive of infection of the urinary tract, obstructing prostate, possibly with infection, or stone. On the whole any abnormal symptom referable to this system should call for detailed information as to pain or burning, frequency, amount of urine passed, difficulty in starting urination, sudden stoppage and dribbling, with the patient's description of the urine passed.

Catamenia. Women should be questioned concerning the menstrual history: when menstruation began and when it ceased if it has stopped, the duration of individual periods, the amount of flowing, and severity of the pain experienced. Any vaginal discharge should be inquired into, and the presence or absence of flowing between the periods. The number of children borne and miscarriages should be known.

Skin. A complete history should contain some reference to the integument of the body. Past skin troubles, such as boils, abscesses, or rashes, should be known to the physician, for occasionally important evidence may be gained from such data. As is well known, infection of the skin may be an accompaniment of diabetes, and a non-itching rash in an earlier period of a patient's life may lead to a search for syphilis, as may an abnormal alopecia. Changes in the texture of the skin and hair may be evidence of hypo-secretion of the thyroid gland, and general enlargement of the superficial lymph nodes may be sufficient to suggest syphilis or lymphatic leukemia. Excessive perspiration often denotes a nervous instability and may serve as an aid in a general classification of the patient.

Weight. At some point in the history marked changes in weight should be noted, and it is always well to know what the best weight was, and when. Valuable information may sometimes be gained by recording the weight of the patient as it was five years and one year before examination.

Neuro-Muscular. A neuro-muscular heading is advisable in the complete history, and under this may be included changes in temperament, loss of memory, nervousness, paralyses, taxia, and muscular weakness.

An attempt has been made to present the historical health features that should be known to the physician whose object it is to gain all possible information concerning a patient that may bear on his present health. Where it has seemed necessary points have been elaborated that seemed worthy of such consideration; that is, some indications have been given of the types of questions that should be asked where answers to more general questions have demanded such investigation. All the questions suggested need not be asked, but the inclusive questions that will indicate the necessity of more detailed questioning should be asked. On such a basis the history taking will not be nearly so formidable as it may have been made to appear, and certainly the written record of the history may be quite brief, as it would necessarily be on the appended form.

Environment. Last but not least, it is of the utmost importance to appreciate the patient in relation to his environment. Is he suited to his surroundings and is he happy in them? Is he cheerful and sanguine, or moody and depressed? Is he phlegmatic or is he nervous and apprehensive regarding his health? When did he last consult a physician, and for what reason? How much time has he lost from work on account of illness? The answers to these questions may serve a very useful purpose in giving the shrewd physician an idea as to why the patient has certain complaints, as to whether they are real or imaginary, and how an improvement may be brought about.

CHAPTER III

The Physical Examination

Equipment. The requisite equipment for the physical examination should consist in the following articles:

Weight scales
Measuring rod
Snellen vision chart
Electric flash light
Tape measure
Tongue depressors
Stethoscope
Soft pencil
Tallquist hemoglobin scale
Blood pressure instrument
Wassermann tubes
Assorted antitoxin needles
Glass syringe (10-30 c.c. capacity)
Glover's needle
Medicated alcohol
Sterile sponges
Urinometer
Litmus paper
Benedict's qualitative or
Fehling's solutions
Test tubes
Wine glass
Filter paper
Nitric acid
Bunsen burner or spirit lamp

The male patient should be examined naked. The female patient should be stripped to the waist with a sheet draped over the shoulders, and the shoes and stockings removed.

Temperature. The advisability of temperature taking must be decided for the individual case. Most physicians do not consider it a part of routine examination.

It is a matter of convenience to perform first as much of the examination as must be done or can most easily be done with the patient standing. The following sequence has been found practical and convenient, although many physicians may prefer to perform their examinations differently.

Vision. The height and weight having been recorded the eye test may be performed, or this may be done before the clothes are removed. The eye chart should be well illuminated and placed on a wall at about the level of the eyes. The patient stands directly facing the chart at a distance of twenty feet, and reads the lines on the chart with first one and then the other eye covered. If glasses are worn, the test should be made first without and then with the glasses. The number of the line with the finest lettering that can be read correctly represents the denominator of a fraction of which 20 (the number of feet distant from the chart) always represents the numerator. 20/20 may be considered as perfect vision as far as this method of examination is concerned; the greater the denominator, the greater is the defect in vision for that eye. As a rule any defect greater than 20/30 or 20/40 should require correction by glasses, or at least a visit to an oculist.

Inspection. The first and one of the most important parts of the physical examination is the inspection of the patient, and in this inspection should be noted obvious abnormalities, the distribution of subcutaneous fat, the general state of nutrition, scars of vaccination, hypodermic injections, injuries or operations, the texture and distribution of the hair, and the color and texture of the skin, whether dry or oily, warm and healthy appearing or cold, clammy and perspiring. A note should be made of acne or other eruptions. The matter of posture is always of importance, and normal or abnormal carriage may be conveniently classified according to the charts devised in the Department of Hygiene of Harvard University. The physical efficiency of the individual is unquestionably dependent to a considerable extent on his body mechanism, and such defects should be pointed out and their importance explained; the insufficient pulmonary ventilation resulting from the rounded shoulders and the sunken chest, the liability to back strain from the lordotic lumbar curve, and the intestinal symptoms that may be produced by the ptotic abdomen with its relaxed musculature.

Hearing. The hearing in either ear should be tested roughly by voice or the sound of the watch and an opinion formed as to whether or not an aurist need be consulted.

Eyes. The vision has already been tested. The equality or inequality of the pupils should be noted, a difference in size suggesting the possibility of a nerve palsy which may be due to syphilis. In the absence of drugs, dilated pupils suggest nervous instability, as does "dancing" or rapid changes in size of the pupils. The reaction of the pupils to light and distance should be tested, the former being most important, as pupils that are fixed to light are often due to syphilis of the central nervous system.

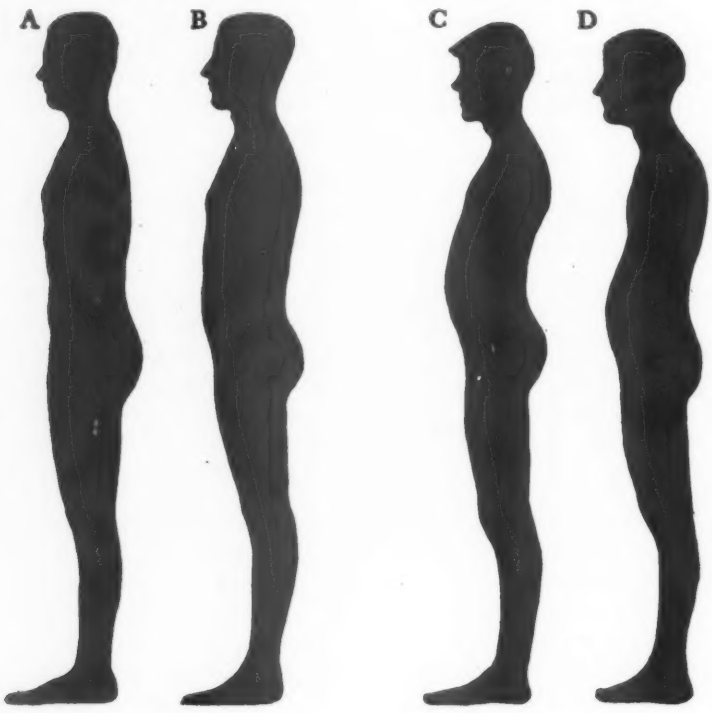
Nose. The nostrils should be tested separately for obstruction, and may be examined with the nasal speculum for evidence of septal spurs, perforated septum, polyps, etc. Old and poorly reduced fractures may give rise to considerable difficulty with nasal breathing; obtructive adenoid tissue may cause difficulty at all times and be responsible for the typical adenoid facies.

Mouth. It must be borne in mind that the mouth is an important organ of the body and not simply an opening through which to examine the throat. The color of the mucous membranes is a much more important superficial indicator of hemoglobin deficiency than is the color of the skin. Chronic lip sores should not be disregarded, and it must be remembered that in general cancer is more apt to occur on the lower lip and chancre on the upper. Spongy bleeding, retracted gums indicate pyorrhoea alveolaris, and often pus may be expressed along the gum line. In the event that symptoms suggesting lead colic have been elicited in the history, the blue stippled lead line should be sought on the outside of the lower gum, remembering that it may be confined to a very limited area. In such a search a magnifying glass should be used.

Nervous instability or alcoholism may be suggested by a tremulous tongue, indigestion or constipation by a coated one, and hyperacidity

BODY MECHANICS

The right way The wrong way



(A) Excellent Mechanical Use of the Body

1. Head straight above chest, hips and feet.
2. Chest up and forward.
3. Abdomen in or flat.
4. Back, usual curves not exaggerated.

(B) Good Mechanical Use of the Body

(Compare with Fig. A)

1. Head too far forward.
2. Chest not so well up or forward.
3. Abdomen, very little change.
4. Back, very little change.

(C) Poor Mechanical Use of the Body

(Compare with Fig. A)

1. Head forward of chest.
2. Chest flat.
3. Abdomen relaxed and forward.
4. Back curves are exaggerated.

(D) Very Poor Mechanical Use of the Body

(Compare with Fig. A)

1. Head still farther forward.
2. Chest still flatter and farther back.
3. Abdomen completely relaxed, "slouchy."
4. Back, all curves exaggerated to the extreme.

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By courtesy of the Department of Hygiene, Harvard University.

by an unusually clean one. A shiny red tongue with atrophied papillae is sometimes found in pernicious anemia. Evidence of chronic irritation from irregular or broken teeth should not be neglected, as such an irritation may be the fore-runner of cancer of the tongue. The irregular markings of the so-called geographical tongue are probably unimportant, but the hard whitened areas of leukoplakia have been found sometimes to precede cancer. Carious, broken, and jagged teeth, false teeth, missing teeth, and crowned teeth should of course be noted and proper advice given according to the indications.

Throat. Inspection of the throat should be made with a good light and with the tongue depressed, and a note should be made of the presence of post-nasal discharge, chronic pharyngitis, excessive lymphoid tissue, and hypertrophied, buried, or infected tonsils, or tonsils showing the scars of past infection.

Neck. Enlarged lymph nodes should be searched for under the angle of the jaw, before and behind the sterno-mastoid muscle, below

the occipital region, and in the supraclavicular fossae. When enlarged nodes are the result of infection it may be said that in general glands below the angle of the jaw, anterior to the sterno-mastoid muscle, are due to infected tonsils, those behind the muscle to adenoids, and those below the occiput to infection of the scalp. The possibility of chronically enlarged glands being tuberculous should not be overlooked. So-called "sentinel" glands in the supraclavicular fossae should call attention to the possibility of infection or malignancy of the pleura or stomach. The thyroid gland should always be palpated for enlargement of one or both lobes. In the presence of enlargement, and in the absence of signs of thyrotoxicosis, such as exophthalmos, tremor, tachycardia, nervousness, and loss of weight, or of mechanical obstruction to breathing, the diagnosis of cystic, colloid, or adenomatous goitre may be made. The possibility of malignancy must, however, be ruled out.

Other lymph nodes. At this point in the examination it is well to palpate rapidly the axillae, the epitrochlear areas on the inner aspect of the arms just above the elbows, and the inguinal regions, for enlargement of the lymph nodes in these locations. A few nodes in any or all of these regions may be found to be enlarged in the healthy individual. Unusually firm glands in any place may furnish corroborative evidence of cancer, and if a malignant source is proven, they indicate, of course, metastasis. A source of infection in any part of the body is very liable to cause enlargement of the nodes draining that area. A slight general adenopathy is frequently found with active syphilis, and if the enlargement is of any degree lymphatic leukemia must be suspected.

Heart. The heart area should be inspected and palpated before percussion and auscultation are employed. A visible or palpable apex impulse may give a very good indication of the size of the heart; if outside the mid-clavicular line some degree of hypertrophy is probably present; if below the fifth intercostal space, aortic regurgitation may be suspected. Visible retraction of the skin at the point of the apex impulse is sometimes evidence of adhesive pericarditis. A thrill palpated with the palm or the edge of the hand indicates some abnormality of a heart valve, either acquired or congenital.

Percussion of the heart borders should give information as to three dimensions: the right and left borders, and the width of the great vessels. Depending, of course, on the thickness of the chest wall of the individual, percussion may be more or less accurate, and depending on the size of the thorax the dimensions may vary greatly within normal limits. Disregarding the more accurate method of estimating the heart size by percussion, such as measuring the left border always in relation to the mid-clavicular line, and dropping a perpendicular to the border from the level of the sternum, it is safe to say that a left border which is within the nipple line is normal. The left border of dulness should be measured in the fifth intercostal space, and the right border in the fourth. The normal right border is rarely far beyond the sternal edge; and the same criterion applies to the supracardiac dulness, measuring the width of the great vessels. Abnormal supracardiac dulness may be due to aneurysm, dilatation of the aortic arch, as it occurs in syphilis, or other abnormality of the mediastinal contents.

Rapidity of the heart rate with signs of cardiac damage absent may be the result of nervousness reaching even to the point of effort syndrome. A rapid rate following effort and continuing rapid during a subsequent rest period should lead to the suspicion of organic heart trouble which should, however, be corroborated by other evidence. A regular irregularity of the heart beat synchronous with respiration—the so-called sinus arrhythmia, is of no importance. Occasional extra systoles or premature contractions in the absence of signs of cardiac damage are also unimportant. All other irregularities may be due to organic lesions.

The normal sounds of the heart may be clear and forcible or faint and muffled, depending on the thickness of the chest wall and the position of the heart within it. A very regular and rapid beat with little differentiation between the first and second sounds suggests myocardial weakness. In young individuals the pulmonic second sound is generally a trifle sharper than the aortic. An increased pulmonic second sound and a very sharp apical first sound are often heard in disease of the mitral valve. An increased aortic second sound may accompany an abnormally high blood pressure.

Great difficulty is often encountered in an attempt to distinguish between organic and functional systolic murmurs. Mackenzie felt that a systolic murmur at the apex not transmitted might be functional to the same extent as one in the pulmonic area. In the examination of students at Harvard it was found that a systolic murmur was frequently heard in the pulmonic area, was not transmitted, and was usually increased in the recumbent position. It was occasionally heard at the apex, sometimes in both places, and less commonly all over the precordia. No other abnormality was found, and it was believed that this murmur was generally inorganic, even in individuals with unstable blood pressure and other disturbing signs. Exercise under these conditions seemed to improve rather than harm the health of the individuals. All diastolic murmurs should be regarded with suspicion, but care should be taken not to confuse a third

heart sound, due to contraction of the auricle and occurring in diastole, with a murmur. The radial and brachial arteries should be palpated for sclerotic tortuosity and hardening.

Lungs. Percussion of the chest ranks equally in importance with all other methods of examination, and careful percussion should never be omitted. In the apparently healthy individual slight dulness at the right apex is not infrequently encountered and is usually due to a healed or active focus of tuberculosis. When this sign is encountered, a recent or remote history of known tuberculous infection, cough, fever, or simply a rundown condition may often be elicited. Some abnormality of the breath sounds may also be found in this locality; breathing of a bronchial or bronchovesicular type with prolonged expiration, and increase in the spoken and whispered voice and in tactile fremitus. Under these conditions the patient should always be required to cough at the end of expiration and follow the cough with a deep inspiration. A shower of fine râles at the end of inspiration denotes activity of the lesion—tuberculous bronchitis. An attempt should then be made to obtain sputum for examination.

Increased dulness between the scapulae or on either side of the sternum is evidence of an increase in the mediastinal contents or of enlargement of the glands of the hilum, generally tuberculous. Limitation of the movements of the chest with increased resonance on percussion and diminished breath sounds suggests emphysema, which may be the result of asthma or chronic bronchitis; râles at the bases in conjunction with evident cardiac damage furnish a sign of congestive heart failure.

Hernia. With the patient still in the standing position, the little finger should be inserted into the external inguinal rings, and the patient required to cough. Before the cough any undue patency of the ring may be determined, and in such cases an abnormal impulse may be felt, even in the absence of a palpable or visible hernia. These patients should be warned against the danger of developing hernia under unusual strain. The femoral region and the umbilicus should also be palpated for hernia.

Genitalia. The prepuce of the penis should be retracted and the glans examined for scars. Varicocle of any degree should be determined, but surgical interference should not be advised unless marked symptoms are caused by the veins. Where mild symptoms are present a simple suspensory may be recommended. The testes should be palpated and their presence or absence noted, as well as any abnormality in size and consistence. It must be borne in mind that atrophy of one or both testes may be a result of mumps. A smooth, compressible mass attached to testis or cord should be transilluminated with the flash light to determine any fluidity of its contents. Any interference with hydrocele by tapping or surgery should be decided on the basis of size, discomfort, or frequency of recurrence. A solid mass attached to the testis may suggest tuberculous epidydimitis or gumma of the gland.

Feet. The position and use of the feet should be noted with the patient standing. Low arches if the position and flexibility of the feet are good are of much less importance than are pronated or rigid feet. Hammer toe and hallux valgus may be a source of great discomfort and loss of efficiency, even to the point of requiring operation. At this time, or after the patient has lain down, the feet should be examined for tender points or rigidity. In general a flexible foot, regardless of its appearance, functions better than does a rigid one. Advice regarding the selection and fitting of shoes may be necessary, important points to remember being, breadth of last, toe room, a straight inner side to the shoe, and a shank that does not start to arch anterior to the base of the metatarsal bone; the metatarsal should lie flat for its entire length.

Anus and Rectum. External hemorrhoids may be found by having the patient stoop forward, separating the buttocks with his hands, and "bearing down" slightly as if to move the bowels. If internal hemorrhoids or other disease of the rectum are suspected, a rectal examination should be made. Digital examination of the rectum should also be performed with finger cot or rubber glove if urinary symptoms suggestive of an obstructing prostate have been elicited. It must be borne in mind, however, that an obstructive prostate may be present with little or no physical signs of hypertrophy.

The entire examination as far as described may be performed if the physician desires with the patient standing. He should now lie flat on his back on the couch or table.

Blood Pressure. The blood pressure may have been taken with the patient standing, but for purposes of convenience, and particularly when blood is to be taken for the Wassermann test or chemical analysis, it is preferable to have the patient recumbent. Most physicians will use an aneroid sphygmomanometer. The collapsed rubber bag is placed on the bare arm above the elbow and over the brachial artery, and the remainder of the sleeve is wrapped around like a bandage, the last few inches being tucked under the preceding fold. The manometer is attached to one of the tubes and the bulb to the other and the manometer is hung to the hook or otherwise attached. The auscultatory method should be used. The stethoscope is placed over the brachial artery at the bend of the elbow, and the pressure advanced about 20 mm. beyond the point where the sounds of

the blood column disappear. The pressure is then gradually released.

During the lowering of pressure four phases are encountered. The first is when a clear sharp sound replaces silence. This is the index of systolic pressure. The second is when a murmur replaces this sound. The third is when a clear snappy sound replaces the murmur. The fourth is when the clear sound is suddenly or gradually transformed into a dull one. This is the index of diastolic pressure.

Three pressures are of importance: the systolic or maximal, the diastolic or minimal, and the pulse pressure, which is the difference between the two, and represents the efficiency of the heart, or the extent to which it overcomes the peripheral resistance.

The proper interpretation of blood pressure presents great difficulties owing to the possible wide ranges of pressure consistent with normality. Working with young adults at Harvard, the Department of Hygiene found that the average systolic pressure was approximately 120 mm. of mercury; the average diastolic pressure 80 mm. Arbitrarily 140 mm. was determined upon as the upper normal limit for systolic pressure, and 100 mm. for diastolic pressure. The pressure was often found to vary by as much as 15 mm. between the standing and the recumbent positions, the diastolic being much more uniform than the systolic. Nervous instability or excitement may account for a high pressure which comes to normal after rest, and with other signs of circulatory or renal disease absent, too much emphasis should not be placed on the blood pressure alone. Even an idiopathic and persistent high pressure is compatible with health and longevity. A systolic pressure above 150 or 160 mm. and a diastolic pressure above 110 mm. are generally pathological. A pulse pressure below 25 mm. signifies insufficiency of the heart muscle, and over 50 mm. is very probably an indication of aortic regurgitation. A low blood pressure may be due to neurasthenia or debility from such causes as anemia or Addison's disease; a persistently high pressure is at least circumstantial evidence of arteriosclerosis or chronic nephritis. A very rough but practical criterion of the average normal pressure is 100 plus the age of the patient for the systolic pressure, and 25 to 50 below this for the diastolic.

If venous blood is to be taken for the Wassermann or other tests, the most convenient time is while the manometer cuff is on the arm. This technique will be described later. In case any abnormality of the heart had been suspected during the examination of the standing patient, this should be corroborated with the patient recumbent, as in this position most murmurs become more distinct.

Abdomen. An idea of the fullness of the abdomen and the tone of its muscular wall has been gained with the patient standing. It should now be percussed and palpated with the patient resting on his back. In order to gain complete relaxation he should be instructed to draw up his knees and open his mouth. Light percussion should be performed to determine gaseous distention or the presence of solid masses. The abdomen should then be palpated gently but deeply for masses, abnormal size or position of the organs, tenderness, and spasm. In the normal subject the liver, spleen, and kidneys are ordinarily not felt. Occasionally the liver edge may be felt when the organ is pushed down by a deep inspiration. The kidneys should be palpated bimanually with one hand in the flank below the costal border and the other opposite it on the front of the abdomen. An abnormally large or ptotic kidney may be felt between the hands on deep inspiration.

Reflexes. The knee jerks may be tested with the hand or the reflex hammer, striking quickly on the patellar tendon with the left hand supporting the flexed and relaxed knee. Hyperactive knee jerks are often present in a nervous, over-mobilized individual, and are generally of no further significance. It is often difficult to obtain the knee jerks in phlegmatic patients. When the knee jerk cannot be obtained with the patient recumbent, he should sit with his feet over the edge of the couch or table, and throw one leg over the other. Sometimes it may be necessary to reinforce the reaction by instructing him to hook his hands together and pull them against each other. This provides a new channel for cortical impulses and releases the cortical inhibition on the reflex arc. Absent knee-jerks are sometimes found due to no discernible cause. They may be permanently absent as a result of diphtheria or syphilis of the central nervous system. Irritation of the nervous system from any cause, such as meningitis, intracranial pressure, tetany, or tetanus, may increase the activity of the knee jerk.

With the apparently healthy individual no nervous reflexes need ordinarily be tested other than the knee jerks and the pupillary reactions. If tabes dorsalis is suspected, Romberg's sign may be employed. This consists in having the patient stand with the feet close together and the eyes closed. Inability to maintain the balance suggests a lesion of the dorsal columns.

Extremities. The recumbent position of the patient presents a good opportunity to determine the presence or absence of edema of the shins and ankles, and to test the flexibility of the feet. Edema of the ankles may frequently be due to varicose veins of the legs or even the result of long continued maintenance of the standing position, particularly in persons whose circulation is not active. Where edema is the result of actual pathology in the circulatory system it suggests a cardiac origin when

confined to the extremities, and a nephritic origin when more generally distributed, and particularly when occurring under the eyes. Edema of the lids is frequently associated with trichinosis.

The urine should always be analyzed and the hemoglobin tested. These examinations will be described in the chapter on Special Procedures.

The fact should never be lost sight of that the patient seeking a health examination is also seeking advice as to the best means of improving his physical condition, whether or not he is actually suffering from organic disease. Such advice the physician must give freely and intelligently. It is not enough for the patient to know that he is in health at the time of the examination; he wishes also to know how to preserve his health. If he has organic or functional defects he must know how to overcome them as far as is possible or at least prevent their progression. Consequently advice must be given on every point of the examination that seems to require it from posture to care of the teeth; from diet to exercise. In this way the health examination justifies itself and becomes part of a definite constructive health program.

In the final summary the possible need of special procedures not performed in the routine test must be considered, as must perhaps examinations by specialists. If such indications are present the patient must be advised of them and any necessary arrangements made by the examining physician.

CHAPTER IV

Infants and Children

Physicians are being called upon more and more to direct the development of infants and children, and in such an activity very promising results may be expected. It must be remembered, however, that the infant and young child differ in many important respects from the adult; the stage of life is essentially a developmental one; the physical examination presents entirely different features, and the variations from the normal are of a different type.

Inspection. In examining an infant especial attention should be paid to inspection. Inspection alone may reveal many characteristic abnormalities: the disproportionately large head of the hydrocephalic, or the small head of the microcephalic; the slanting eyes and button nose of the Mongolian idiot; or the heavy features and protruding tongue of the cretin. The infant may be placid, contented, and normal, or unhappy with the irritability of undernutrition or hypertonicity.

Skin. The skin of the infant should be examined particularly for sores or eruptions, eczema, and elasticity or turgor. The quality of the turgor may be determined by picking up a fold of the skin of the abdomen in the fingers. If there is sluggishness in returning to its normal position; if it is plastic rather than elastic, serious depletion of body fluids may be assumed.

Many infants have seborrhoea capitis or cradle cap. This is removed with patience by systematic applications of olive oil followed by warm water and soap washings. Rawness of the buttocks is due to diarrhoea or the ammoniacal diaper. The latter cause may be prevented by rendering the diapers antiseptic by rinsing in boric acid solution. Fissures about the anus and at the corners of the mouth and eruptions on the palms and soles suggest congenital syphilis. Coarse dry hair and dry skin are accompaniments of cretinism.

Head. The fontanelles should be examined to gain an idea as to size and tension. A bulging fontanelle may be a sign of abnormal intracranial pressure or merely the result of active crying on the part of the infant. A depressed fontanelle indicates insufficient body fluid. Lateral flattening of the skull, an asymetrical skull, or prominent parietal bosses, are almost pathognomonic of rickets, as is the buckling on pressure of the outer table of the skull—craniotabes. Craniotabes may be confined to a sharply localized area of the occipital bone, or it may be found only in the region of the mastoid fontanelles. It should be considered of doubtful value when occurring along the suture lines or during the first two months of life. Under these conditions it is probably due rather to osteoporosis than to rickets. Excessive head sweating may be a sign of active rickets.

The mouth and throat of the infant should always be examined for cleft palate or the arched palate of the mouth breather. If adenoid growths are suspected, they may be felt with the index finger behind and above the soft palate. Chronic snuffles are suggestive of congenital syphilis. Obstructive adenoids should be removed at any age, and this is particularly important in the presence of chronic otitis media. With a hyperesthetic or extremely irritable infant, or one who has had convulsions, a sign of tetany should be sought by tapping with the forefinger over the inferior branch of the facial nerve in front of the ears to elicit twitching of the face (Chvostek's sign), or over the superior branch to elicit a contraction of the orbicularis palpebrarum muscle (Weiss' sign).

Neck. Enlarged lymph nodes should be felt for in the neck. If found they may be due to infection of the adenoids, throat, or middle ear, or they may be tuberculous. Both acute and tuberculous adeniti are common in infancy and childhood. Tuberculous adenitis is frequently bovine in origin and is due to infection of tonsils or adenoids through the ingestion of infected milk.

Dyspneic breathing with retraction of the soft tissues of the neck above the clavicle and sternum is evidence of respiratory obstruction at or below the larynx, and is most commonly due to a congenital defect of the larynx or pressure from enlarged bronchial lymph nodes or an enlarged thymus.

Chest. Many deformities of the thoracic wall may be the result of rickets. The pigeon breast is a later example of such deformities. Flaring of the ribs below a groove coinciding with the insertion of the diaphragm (Harrison's groove) may be evident in the latter part of the first year of life. Beading of the ribs—the so-called rachitic rosary—consisting of enlargement of the costochondral junctions is one of the earliest signs of rickets. It must not be confused with the normal slight enlargement often noted in the first month of life.

Heart. Cardiac defects other than congenital ones are extremely rare in infancy. A systolic murmur at the base may be functional or due to anemia. Many murmurs or combinations of murmurs occur in congenital heart disease. A mild degree of cyanosis may result from an open foramen ovale or a slight pulmonic stenosis, and a severe degree is generally due to stenosis of the pulmonary artery. Many types of congenital cardiac defects are consistent with a normal life and development. The prognosis must be based entirely on the degree of functional disturbance.

Lungs. Areas of dulness with diminished breath sounds of the bronchial type may be due to congenital atelectasis or failure of the alveoli to expand at birth. The prognosis must be based on the degree of involvement and the permanency of the condition. Diaphragmatic herniae are occasionally encountered in which more or less of the abdominal contents are found in the chest cavity, giivng rise to signs suggestive of pulmonary pathology. Interscapular and parasternal dulness or bronchial breathing with increased voice sounds over the upper thoracic vertebrae are suggestive of enlarged hilum glands which may be tuberculous in nature.

Abdomen. The infant's abdomen is naturally more protuberant than is that of the adult. The liver edge is frequently palpable. An enlarged liver and spleen may be due to rickets or syphilis. Umbilical hernia is common and should be strapped in such a way that the edges of the rectus muscles are approximated with the umbilicus folded under between them. A permanent cure is generally effected in this way.

Extreme protuberance of the abdomen is associated particularly with three diseases: megacolon, chronic intestinal indigestion, and tuberculous peritonitis, and the differential diagnosis must be made on the basis of symptoms and other signs. Congenital inguinal herniae are occasionally encountered, and while they may he supported temporarily by the yarn truss, operation is generally necessary for a permanent cure.

Genitalia. The scrotum should always be examined to determine the presence of both testicles. An undescended testicle may often be felt in the inguinal canal, and is usually associated with hernia. Undescended testicles may occasionally descend during the first months of life; otherwise they should be operated on in early childhood and brought into normal position or removed. Hydrocele is occasionally encountered. The foreskin should always be retracted as far as possible and instruction given concerning the regular performance of this duty and cleansing of the glans. Preputial adhesions should be broken. Circumcision for phimosis or redundant prepuce should be delayed until after the diaper-wearing age unless infection renders it imperative.

Extremities. Enlargement of the radial and tibial epiphyses constitutes one of the later signs of rickets, as, of course, does bowing of the long bones. Rachitic bowing of the tibiae must not be confused with the normal bowing of early infancy. The general posture and use of the feet should be noticed in infants old enough to stand. Normally, the spine is flatter and straighter than in the adult, and the normal tendency for the feet is to point in. If the feet point out in walking, pronation is liable to be the result, and this may partially be offset by putting a slight lift (⅛″) on the inside of the heel. Shoes for walking infants and young children should have flat or almost flat heels, soft uppers, and about a half inch extra length for the toes.

THE OLDER CHILD

The examination of the older child follows much more closely the rules laid down for the adult. In general, however, the types of chronic disease to be on the watch for differ, and relatively greater attention should be paid to factors of weight and height, exercise, rest, and diet. Chronic infections and anomalies of the nose and throat are of relatively greater importance, and the problem of nutrition should always receive some thought.

FEEDING PRINCIPLES

As general prophylactic measures it is well to see that artificially fed infants are fed on sterilized milk, receiving at least one and a half ounces for every pound of body weight to fulfill their protein requirement, with sugar of some sort added to make up their caloric needs, which are roughly fifty calories per pound for the first three months of life, gradually reducing to thirty-five or forty for the last three months of the first year. Three ounces of total fluid per pound should be provided in the formula, up to a total of about thirty-six ounces a day in the first year. Orange, tomato, or cabbage juice should be supplied daily as an anti-scorbutic factor, and cod

liver oil and sunlight for the prevention of rickets. After six or seven months strained vegetables and cereals should be added to the diet.

DEVELOPMENTAL STANDARDS

It is well to have at hand for comparative purposes certain facts concerning the average normal standards of development. The average birth weights of infants are seven pounds for girls and seven and a half pounds for boys. A slight initial loss is to be expected. The weight should be doubled at six months and trebled at one year. At two, three and four years the average weights are, respectively, for the sexes, 27 and 26, 32 and 31, and 36 and 35 pounds. The average birth length is 20½ inches. At one year it is 29, at two years 32½, at three years 35, and at four years 38 inches. At birth the circumference of the head is slightly greater than that of the chest. From the twelfth to the eighteenth month they are about the same, after which the development of the chest proceeds at a greater rate.

The main sutures of the skull are ossified at from six to nine months. The posterior fontanelle is normally obliterated at two months, and the anterior fontanelle between the fourtenth and twenty-second month.

The head is held erect with the trunk supported at four months, the infant stands with assistance at eleven or twelve months, and walks alone between the fourteenth and fifteenth months. At one year a child should have six teeth, at one and a half years, twelve teeth, at two years sixteen teeth, and at two and a half years twenty teeth. Of the permanent teeth, the first molars appear at six years. Rickets may be a factor in delayed dentition, and it should be impressed upon the patient that the deciduous teeth are deserving of as much care and attention as the permanent set.

CHAPTER V

Special Procedures

URINE

Examination of the urine forms an important part of any complete physical examination. For ordinary purposes the single specimen is sufficient. Where any pathological condition affecting the urine is suspected, a 24-hour day and night specimens should be examined. The day and night specimens are particularly valuable when nephritis is suspected, for an impaired kidney will lose its power of concentrating the urine; that is, of excreting waste products with a diminished water excretion, hence the night urine of a nephritic will approach in quantity the day urine and will be of nearly the same low specific gravity.

Specific Gravity. A high specific gravity in a single or a day specimen denotes a comparatively low excretion of water in relation to the amount of solid excretion, and may result from a diminished fluid intake, an excessive fluid output, other than through the kidneys, or diabetes. In diabetes, the total fluid output may be high as a result of the body's attempt to dilute the great amount of sugar being excreted through the kidneys. The specific gravity of the urine should be read with the urinometer cylinder standing on a level table or shelf, with the urinometer floating free of the sides. The interpretation is in terms of the specific gravity of distilled water, or 1.0. The readings on the scale, taken at the surface of the fluid, are expressed as thousandths. Thus, the specific gravity of water is 1.000. A normal urinary specific gravity may vary, according to the individual's fluid intake, from 1.005 to 1.030. The specific gravity of diabetic urine may be as high as 1.045, even though the urine is clear and light in color.

Sugar Test. Fehling's solution or Benedict's qualitative solution may be used to test for sugar. When Fehling's test is employed, the two solutions—copper sulphate and potassium tartrate—should be mixed fresh in equal quantities and brought to the boiling point. To about 5 cc. of this solution from 1 to 2 cc. of urine are added and the solution is again boiled. If sugar is present in the urine the oxide of copper is formed as a brick red precipitate, more obvious after cooling and settling. With Benedict's solution, about 8 or 10 drops of urine are added to about 5 cc. of solution and boiled for not over five minutes, preferably, though not necessarily, in a water bath. After cooling, a yellow or brownish red precipitate is noted if sugar is present. This test is more delicate than Fehling's test as minute quantities of sugar may give a positive test, and a concentrated urine may cause a clouding of the solution with a resulting slight grayish precipitate. Such reactions are often confusing and give rise to doubt as to the proper interpretation of the test.

No single positive test for sugar should be taken as final proof of diabetes. Following a heavy meal or following the ingestion of large amounts of sugar an alimentary glycosuria may ensue. Emotional glycosurias under excitement, as in athletes before a football game, are not uncommon. Some individuals with a low renal threshold for sugar may excrete it into the urine without a rise in the blood sugar. In case of doubt as to the significance of repeated or occasional positive tests for sugar in the urine, the blood sugar should be tested.

Albumen. The simplest test for albumen in the urine is Heller's nitric acid test. Some examiners prefer to pour the urine into a wine glass and underlay with concentrated nitric acid which is poured down the side of the glass. A convenient method is to pour the acid into the glass first, support a cone of folded filter paper on the brim of the glass, place a bit of litmus paper in the filter paper cone, and pour in the

urine. By this method the reaction of the urine is obtained and the urine is filtered at the same time, dropping onto the surface of the acid. The test should be allowed to stand for three minutes before reading, and should then be read against a black background. The presence of albumen is denoted by a white line occurring at the junction of the urine and the acid. The slightest possible trace, or S. P. T., can be seen only against the black background. A very slight trace, V. S. T., can faintly be seen against light. A slight trace, or S. T., is barely visible from above; a trace, T., is plainly visible from above, and a large trace, or L. T., forms a thick and opaque mass.

With other evidences of chronic nephritis, the slightest possible trace of albumen, even with a negative urinary sediment, is of significance. Fairly large amounts of albumen, however, may be present and of no significance in nervously unstable individuals. This so-called orthostatic albuminuria is generally absent in the morning urine or after the individual has been resting in the recumbent position. It should not be considered of any pathological significance. The sediment in these circumstances is negative. Albumen may be present when blood or pus is present in the urine.

Sediment. The urinary sediment, either centrifuged or after settlement by gravity, should be examined if albumen is present and has been determined not to be orthostatic. Symptoms suggestive of pathology in the urinary tract should also warrant such an examination. Crystalline elements of epithelial cells are rarely of significance. Granular or hyaline casts are suggestive of nephritis or toxic irritation. Cell casts or blood casts denote activity of the renal process. Pus cells, particularly in the male and particularly if clumped, and always in the catheterized specimen, denote infection. Red blood cells are always important except in the female at the time of menstruation, and may be due to active nephritis, renal or bladder stone, or new growth.

BLOOD

Hemoglobin. The hemoglobin percentage of the blood should always be tested by some method, of which the Tallquist is the simplest. If the Wassermann test is being performed, a drop of blood from the needle may be dropped on the absorbent paper provided with the scale. Otherwise the lobe of the ear should be rubbed with alcohol and punctured with a sharp cutting needle, deeply enough so that the blood will drop out without squeezing of the tissues. The drop should be allowed to spread in the paper, waiting until it is no longer wet and shiny, but not until it has dried completely, and it is then matched with a color in the scale, through the hole provided for the purpose. The background behind the drop should be white and the light should not be allowed to shine through it. Ninety percent. may be considered a satisfactory percentage.

Smear. A blood smear should be taken to be stained and examined by the physician or some one more expert if malaria, anemia, splenomegaly, leucocytosis, bleeding or any other abnormal blood condition is suspected. Two cover glasses should be washed clean and polished, and a pin-head-sized drop of blood allowed to fall on one of them. Immediately the other glass is superimposed with one edge jutting over the edge of the first one. The drop of blood will spread between the glasses for a few moments, and as soon as it has stopped spreading and before it has had time to coagulate, the cover slips should be drawn quickly away from each other by their over-lapping edges in a sliding manner without allowing their surfaces to be pulled directly away. The blood should then be allowed to dry. One or two even smears may be obtained in this way. Small pill boxes containing layers of cotton wool are convenient in which to carry both clean cover slips and the prepared smears.

Wassermann Test. Equipment for taking blood for the Wassermann test consists in a glass syringe of 5 to 30 cc. capacity, a 22 to 19 gauge antitoxin needle, the size depending upon the size of the vein, about a 20 gauge being the most practical, the blood pressure instrument or a piece of rubber tubing, and a glass test tube with a stopper. It is important that the needle be sharp. Blood is most conveniently taken while the blood pressure bag is still on the arm in position to be used as a tourniquet. The needle is attached to the syringe, the open tube for receiving the blood is placed close at hand, and the skin of the cubital fossa is washed with alcohol. The blood pressure bag is then inflated to a point between the known systolic and diastolic pressures; the point at which the venous return is prevented while the arterial supply keeps coming into the forearm. The veins will then become engorged and this engorgement may be aided by having the patient alternately open and close the hand, finally keeping the fist clenched. The most prominent vein, generally the median basilic, occasionally the cephalic is selected. Invisible veins are often easily palpable with the forefinger. The needle is then thrust gently into the lumen of the vein, bevelled surface uppermost, keeping its shaft as nearly parallel with the surface of the skin as possible. From 3 to 5 cc. of blood are withdrawn into the syringe—more if chemical tests are required—the patient is instructed to open the hand, and the air in the blood pressure bag is released, or the rubber tubing tourniquet is removed. A sterile sponge is placed over the point of entrance of the needle, and as the needle is withdrawn pressure is applied over this. The patient is instructed to raise the arm and hold the sponge firmly pressed over the vein to prevent extravasation of blood and a resulting hematoma, while the examiner discharges the blood

obtained into the waiting tube and washes the syringe and needle thoroughly in cold water. After use, alcohol and ether should be run through the needle to prevent rusting, and the plunger should be removed from the barrel of the syringe. The syringe and needle used in taking blood for the Wassermann test should be dry or rinsed with sterile salt solution as alcohol may cause hemolysis.

Directions for procuring material for the Wassermann test are given in the appendix. Any physician of Massachusetts is entitled to free Wassermann service by the State through his local health board. In addition a small number of health boards and hospital laboratories furnish this service.

Since the sharpness of the needle is often the determining factor between success and failure in intravenous work, a fine oil- or whetstone should be kept on hand and needles sharpened as necessary. In sharpening needles it is important to remember that the oblique beveled surface of the needle must be kept flat on the surface of the stone. After sharpening, the point of the needle should be tested and a wire run through to clean the lumen.

When a doubtful or positive Wassermann report is received on a patient in whom syphilis is not suspected, the test should be repeated, if possible at another laboratory.

Blood Sugar. The normal blood sugar in the fasting subject is approximately 0.1 per cent., or 100 mgm. in 100 cc. of plasma. Blood for sugar analysis should always be taken with the patient fasting, the indication being a persistent glycosuria where it is necessary to differentiate between renal glycosuria and true diabetes, or to determine the severity of a diabetes, or to regulate its treatment. The technique for obtaining the blood is the same as that for the Wassermann test except that the blood is discharged into a one- or two-ounce bottle containing a few crystals of potassium oxalate and immediately shaken to prevent coagulation. Before being sent to the laboratory the blood should be kept in the ice box; and if more than a few hours' delay is necessary, a drop of 1 per cent. formalin should be added as a preservative. Three to four cc. of blood are necessary for this test.

Blood Non-Protein Nitrogen. The non-protein or urea nitrogen content of the blood serves as a valuable renal function test where nephritis is suspected or known to exist. The normal non-protein nitrogen content of the adult blood is from 30 to 35 mgm. per 100 cc. of plasma, and that of the urea nitrogen from 15 to 20 mgm. The technique is exactly the same as for the blood sugar, about 5 cc. of blood being necessary.

There are a few private laboratories in the State where these tests are performed, and in most of the larger centres hospitals with well organized laboratories are available where analyses may be performed for a reasonable fee.

SPUTUM

Sputum for examination for tubercle bacilli may be sent to the State or to various municipal diagnostic laboratories in containers provided for the purpose, but many physicians prefer to make their own examinations. Only sputum raised from the bronchi by coughing should be examined. Purulent particles of sputum should be selected with a sterile wire loop and smeared onto a clean slide or cover slip and dried over the flame. This should first be stained with Ziehl's carbol fuchsin for 3 to 5 minutes, heating occasionally to the steaming point. The smear should then be washed with Czaplewski's acid-alcohol decolorizing solution until no more red stain comes off, washed with water, and counter-stained for a few seconds with methylene blue, after which it is again washed, dried, and examined with the oil immersion lens. The tubercle bacilli appear as red rods, and their presence is a positive indication of active tuberculosis.

Sputum may be sent to the State Department of Public Health diagnostic laboratory for pneumococcus typings.

ANTI-TYPHOID VACCINATION

The Massachusetts Department of Health typhoid vaccine contains the typhoid and both alpha and beta paratyphoid organisms. The ordinary course of prophylactic treatment consists in three hypodermic injections, approximately a week apart, the first ½ cc. and each of the others 1 cc. From two to three years is the average duration of immunity after one course of injections. For complete and permanent immunity it is recommended that four series of injections be given, the second one year after the first, the third two years after the second and the fourth three years following the third. Any individuals who may be exposed to typhoid fever should be immunized.

SMALLPOX VACCINATION

Vaccination against smallpox should be performed in the second six months of life, at school age, and thereafter whenever there has been exposure to the disease. The best rule is to revaccinate until an immediate or immune reaction is obtained. There are few, if any contraindications to vaccination.

Vaccination should be performed preferably on the upper arm at the insertion of the deltoid muscle, the skin having been prepared by a thorough washing with soap and water followed by acetone or ether, and allowed to dry. The greatest dimension of any area scarified should not exceed one-eighth inch. The tube of vaccine virus is opened under aseptic precautions and a drop of vaccine placed on the arm. The skin should be made taut by grasping the arm from below with the left hand, and a small superficial abrasion made with a sterile drill, a short

scratch with a sharp needle, or, according to the latest method, the side of the needle may be pressed into the drop about 30 times, the needle being lifted clear of the skin each time. With this method the point of the needle catches the skin, making a minute scarification which should not be deep enough to bleed. Immediately after the pricks have been made, the remaining virus is wiped off with sterile gauze and the sleeve pulled down. No dressings are necessary unless the vesicle, pustule or scab is broken, in which case a few layers of sterile gauze should be applied.

Reactions

Three reactions are possible.

1. *Vaccinia—primary reaction.* On the third to fifth day a papule appears, promptly developing into a vesicle surrounded by an areola of redness and induration. This becomes larger and the vesicle develops into a pustule, reaching its maximum size about the 10th day. The crust falls off after three to four weeks.

2. *Vaccinoid—accelerated reaction.* This occurs in previously vaccinated persons or in those who have had smallpox but have partially lost their immunity. The course is more rapid than that of primary vaccination, the incubation period being shortened to three days or less, and the height of the pustular reaction being reached on about the sixth to eighth day. All symptoms are less severe than in the primary reaction.

3. *Reaction of Immunity—immediate reaction.* This occurs in persons retaining a high degree of immunity from a previous vaccination or from an attack of smallpox. It resembles the cutaneous tuberculin reaction, a small reddened papule appearing in 24 to 48 hours which begins to decline within 72 hours. There is usually no vesicle or a very minute one.

THE SCHICK TEST AND TOXIN-ANTITOXIN

All children between the ages of six months and six years should be immunized with three injections of diphtheria toxin-antitoxin mixture without a preliminary Schick test, as the great majority in this age group are Schick positive. Six months after the immunization, they should be Schick tested to determine the success of the immunization. Between the ages of six and eighteen years the Schick test should be performed and the three injections given if it is positive unless a marked combined reaction is shown, when the toxin-antitoxin may be given in divided doses beginning with 0.1 cc., then 0.2—0.5—1.0 and 1.0 cc. at weekly intervals. All individuals above eighteen years of age who are exposed to diphtheria or may come in contact with it should have the Schick test performed and be immunized with the same provisions regarding marked combined reactions. Immunization with toxin-antitoxin should always be followed after six months by a Schick test, and if the test is positive the injection should be repeated.

The Schick outfit as provided by the Massachusetts Department of Health contains a capillary tube with a definite amount of aged diphtheria toxin; a bottle marked "10 cc. Sterile Salt Solution for Toxin Dilution," and a bottle marked "10 cc. Heated Toxin Dilution, Control." The capillary tube is wiped with alcohol, the ends broken off at the scored marks, and one end inserted in the rubber bulb. With the hand over the hole in the bulb the contents are discharged into the bottle marked "Toxin Dilution." The bottle is shaken thoroughly for 60 seconds. After the dilution is made the toxin should be used within four hours.

The test should be made on the flexor surfaces of both arms using a 1 cc. "Vim Schick Syringé," "Luer," "Record," or other tuberculin syringe graduated in one-tenths, and a sharp-pointed 26 or 27 gauge 3/8 inch needle. On the left arm exactly one-tenth cubic centimeter of the "Heated Toxin Dilution" is injected into the epidermal layers of the skin. Care should be taken in the amount injected and in the placing of the needle between the layers of the skin and not under it. The needle should be inserted with the bevelled surface uppermost and this should barely be buried in the skin. If the injection is properly made a distinct wheal should be formed. On the right arm the toxin dilution should be injected in a similar manner. The absence of any reaction indicates immunity to diphtheria. A positive reaction, according to the description issued by the Department of Public Health, begins to appear at the site of the toxin dilution injection in 24 to 36 hours and is characterized by a circumscribed area of redness and slight infiltration which measures one to two centimeters in diameter. It develops gradually, reaches its greatest intensity on or about the fourth day, then fades very slowly, leaving a scaly, brownish pigmented spot which eventually disappears. There is no reaction at the site of the injection of the heated toxin dilution. The positive test signifies susceptibility to diphtheria.

In some individuals a pseudo-reaction may appear which may be confused with a positive reaction. This is due to protein sensitization. If the reaction appears at the same time at the sites of both injections, running a similar course and reaching a maximum of intensity on the third day and then fading, it is classed as pseudo-reaction and indicates immunity to the disease.

The combined reaction indicates both a sensitiveness to the protein injected and susceptibility to diphtheria; it is consequently a positive test. When a combined reaction is present, the redness and infiltration at the site of the toxin dilution injection will be more marked at the end of twenty-four hours than at the site of the heated toxin injection. At seventy-two hours the positive reaction will be quite distinct, while the control test will show only a blotchy area of pigmentation representing the pseudo-reaction ele-

ment of the test. At the end of ninety-two hours the reaction will be much more marked at the site of the unheated toxin injection.

APPENDIX

Services Offered to Physicians by the Massachusetts Department of Public Health

BIOLOGICAL PRODUCTS

1. *License.*—All products are manufactured and distributed under License Number 64 granted by the United States Treasury Department.

2. *Free Distribution.*—All products are distributed free within the State and under no circumstances are they sold, except .

3. *Sale of Products.*—Parties in other States may obtain these products at approximately cost prices when any surplus supply is available.

4. *Products manufactured:*

Diphtheria antitoxin: 1,000, 5,000 and 10,000 unit packages.

Antimeningococcic serum: 15 cc. vials.

Antipneumococcic serum (Type I): 100 cc. bottles.

Smallpox vaccine virus: 3, 5, 10 and 25 tube packages and in vials.

Bacterial vaccines made from typhoid and paratyphoid A and B bacilli: 1 cc. ampoules and 20 cc. vials.

Diphtheria toxin for Schick test (complete Schick outfits): for 100 tests.

Diphtheria toxin-antitoxin mixture: 1 cc. ampoules and 20 cc. vials.

Horse serum, defibrinated blood and other products for scientific purposes.

Scarlet fever streptococcus antitoxin (Dochez).

5. *Where Products can be obtained.*—At all local board of health offices; in Boston at all distributing stations of the City Department of Health. Emergency supplies (for distribution only when other stations are closed) at—

Boston City Hospital, 818 Harrison Avenue, Boston.

Carney Hospital, Old Harbor Street, South Boston.

Massachusetts General Hospital, Fruit Street, Boston.

Massachusetts Homoeopathic Hospital, East Concord Street, Boston.

Peter Bent Brigham Hospital, 721 Huntington Avenue, Boston.

St. Elizabeth's Hospital, 736 Cambridge Street, Brighton.

Strong Hospital, East Boston.

Other orders should be sent to the Department of Public Health, Room 527, State House, Boston (telephone Haymarket 4600, Lines 38 and 39), or in great emergency to the Antitoxin and Vaccine Laboratory, 375 South Street, Jamaica Plain (Forest Hills Station), Boston (telephone Jamaica 4127).

6. *Size of Orders.*—Limit orders to amounts needed for 10 day periods, and thus use fresh products in the highest state of potency.

7. *Care and Use of Products.*—Keep all packages and containers continuously in an ice cold place. Keep a record of the lot number stamped on each label. Read circular of directions accompanying each package. Use no products after the indicated expiration date on the label—return them to your distributing station.

8. *Information concerning Products and their Use.*—Communicate with the Director, Director, Division of Communicable Diseases, Department of Public Health, State House, Boston, (Haymarket 4600) or the Director, Division of Biologic Laboratories, Antitoxin and Vaccine Laboratory, 375 South Street, Jamaica Plain, (telephone Jamaica 4127).

9. *Visitors* are welcome at the Antitoxin and Vaccine Laboratory, 375 South Street, Jamaica Plain (Forest Hills Station).

ARSENICALS

Arsphenamine, sulfarsphenamine, and bichloridol are distributed from the local venereal disease clinics.

SILVER NITRATE

One per cent. solution of silver nitrate in wax ampoules for the prevention of ophthalmia neonatorum is obtainable from local boards of health or from Room 527, State House.

DIAGNOSTIC SERVICE

The following examinations are made at the Diagnostic Laboratory, Room 527, State House. The specimens are sent to the laboratory in containers to be obtained from the Department by the physicians in attendance or by boards of health.

Throat and nose cultures for diphtheria bacilli.

Throat and nose cultures for hemolytic streptococci.

Throat cultures and smears for organisms of Vincent's angina.

Widal test for typhoid fever, paratyphoid fever (blood).

Culture test for typhoid fever, paratyphoid fever, dysentery (blood, stools, urine).

Sputum for tubercle bacilli.

Urine, spinal fluid, etc., for tubercle bacilli.

Sputum for pneumococcus type determination.

Pus smears for gonococci.

Blood films for malarial parasites.

Spinal fluid for meningococci and other organisms.

Specimens for anthrax bacilli.

Specimens should be sent so that they will reach the laboratory between 8:30 a. m. and 6 p. m. week days; on Sundays and holidays, between 8:30 a. m. and 12 m.

Specimen containers, properly addressed, may be obtained at the Bacteriological Laboratory, Room 527, State House. Orders are filled between 9 a. m. and 5 p. m., week days; Saturdays 9 a. .m. to 12 m. The office is closed Saturday afternoons, Sundays, and holidays.

WASSERMANN LABORATORY

(240 Longwood Avenue, Building D, Room 103)
Boston 17, Mass.

1. Wassermann tests on blood and spinal fluid. This service is obtained directly by the institutions, but indirectly by physicians throughout the State with the exception of those in Boston and Brookline. The procedure is that the physician obtains his special containers from the local board of health. These containers are accompanied by forms made out by the physician and sent to the laboratory together with the specimen. The physicians in Boston and the immediate vicinity usually obtain their containers, together wth the forms which must be filled in, directly from the laboratory and submit specimens without the direction of the local board of health.

2. Gonococcus fixation tests are made under the same conditions as Number 1.

3. Diagnostic laboratory procedures made in connection with the Department of Animal Industry. This includes the examination of material obtained from animals suspected of rabies and other diseased domestic animals, to determine the infectious nature of any smaller or larger epidemic. In order to obtain this service application should be made directly to the Department of Animal Industry.

Examination of pathological tissues for the diagnosis of malignant neoplasms are made at the laboratory of the Harvard Cancer Commission, Harvard Medical School. Containers and instructions are obtainable from State District Health Officers or Room 545, State House.

The State is divided into seven health districts with a State District Health Officer in each. He is available for consultation and advice, and his name and address may be obtained from the Department of Public Health, State House.

CITY OF BOSTON LABORATORY

The laboratory of the City of Boston performs all laboratory work that pertains to diagnosis and control of communicable diseases throughout the city. The services rendered are given free of charge to physicians and residents of Boston.

The following is a list of diagnostic examinations performed:

Diphtheria
Tuberculosis (sputum, urine)
Typhoid (urine and feces—Widal)
Typhus
Malaria
Gonorrhea
Syphilis
Gonorrheal ophthalmia
Rabies
Meningococci
Bacteriological milk examinations
Bacteriological water examinations
(Swimming pools, Turkish baths, Bathing beaches)
Bacteriological examinations of foods
(Shellfish, Tomato products, Meats)
Cholera
Bubonic plague (Rat surveys)
Cultures, spinal fluids, pleural fluids, etc., for organisms.

DIETS

The Normal Diet. The average American eats too much in general and too much meat in particular. The general principles for a normal diet should consist mainly in a proper balancing of the diet with the protein fairly well divided between animal and vegetable protein, with meat at one meal only each day, and with green and coarse vegetables given considerably more prominence than is the present custom. Overindulgance in sugars, starches and fried foods should also be discouraged. It is not the purpose of this publication to provide stereotyped diet lists; these may be found in many textbooks on the subject.

Anti-Obesity List. The principles of a weight-reducing diet should consist in cutting down the use of sugar, starches, and fats, and again emphasizing the substitution of green vegetables, low in caloric values.

Anti-Constipation Diet. An anti-constipation diet should contain considerable amounts of roughage in the form of coarse vegetables and coarse breads, salads, and fruits, particularly cooked fruits. The water intake should be kept at a high level. Sweets and fried foods should be avoided.

Bland Gastric Diet. A serviceable five meal, bland gastric diet is as follows:

Breakfast:
2 slices toast
1 pat butter
2 heaping tablespoonfuls cooked cereal or a corresponding amount of dried prepared cereal
1 teaspoonful sugar
2 tablespoonfuls cream
1 glass milk

10:30—11:30:
Milk and crackers

1:00 p. m.:
1 egg (not fried)
1 potato (not fried), rice, macaroni, or other cereal
2 slices bread
2 pats butter
Baked custard, tapioca, ice cream, or junket

3:00 p. m.:
Milk and crackers

6:00 p. m.:
1 cup cream soup (bean, pea, potato, as-

paragus, celery, lentil, tomato) or oyster stew without the oysters

2 slices cream toast

Cream sauce, apple sauce, baked apple, or junket

Salt should be used sparingly.

Diabetic Diets. Specimen diabetic test diets may be found in any good textbook on the subject. The safest initial treatment of any diabetic should consist in the use of a diet low in fat and comparatively high in carbohydrate; with such a diet, acidosis, the greatest emergency of diabetes, may be avoided.

MEN

Height	19 Yrs.	20 Yrs.	21-22 Yrs.	23-24 Yrs.	25-29 Yrs.	30-34 Yrs.	35-39 Yrs.	40-44 Yrs.	45-49 Yrs.	50-54 Yrs.	55-59 Yrs.
5 ft.....	107	110	114	118	122	126	128	131	133	134	135
5 ft. 1 in.....	112	115	118	121	124	128	130	133	135	136	137
5 ft. 2 in.....	117	120	122	124	126	130	132	135	137	138	139
5 ft. 3 in.....	121	124	126	128	129	133	135	138	140	141	142
5 ft. 4 in.....	124	127	129	131	133	136	138	141	143	144	145
5 ft. 5 in.....	128	130	132	134	137	140	142	145	147	148	149
5 ft. 6 in.....	132	133	136	138	141	144	146	149	151	152	153
5 ft. 7 in.....	136	137	140	142	145	148	150	153	155	156	158
5 ft. 8 in.....	140	141	143	146	149	152	155	158	160	161	163
5 ft. 9 in.....	144	145	147	150	153	156	160	163	165	166	168
5 ft. 10 in.....	148	149	151	154	157	161	165	168	170	171	173
5 ft. 11 in.....	153	154	156	159	162	166	170	174	176	177	178
6 ft.....	158	160	162	165	167	172	176	180	182	183	184
6 ft. 1 in.....	163	165	167	170	173	178	182	186	188	190	191
6 ft. 2 in.....	168	170	173	176	179	184	189	193	195	197	198
6 ft. 3 in.....	173	175	178	181	184	190	195	200	202	204	205
6 ft. 4 in.....	178	180	183	186	189	196	201	206	209	211	212
6 ft. 5 in.....	183	185	188	191	194	201	207	212	215	217	219

WOMEN

Height	19 Yrs.	20 Yrs.	21-22 Yrs.	23-24 Yrs.	25-29 Yrs.	30-34 Yrs.	35-39 Yrs.	40-44 Yrs.	45-49 Yrs.	50-54 Yrs.	Yrs.
4 ft. 10 in.....	98	102	106	110	113	116	119	123	126	129	.....
4 ft. 11 in.....	103	107	109	112	115	118	121	125	128	131	.....
5 ft.....	109	112	113	115	117	120	123	127	130	133	.....
5 ft. 1 in.....	113	115	116	118	119	122	125	129	132	135	.....
5 ft. 2 in.....	116	118	119	120	121	124	127	132	135	138	.....
5 ft. 3 in.....	120	121	122	123	124	127	130	135	138	141	.....
5 ft. 4 in.....	123	124	125	126	128	131	134	138	141	144	.....
5 ft. 5 in.....	126	127	128	129	131	134	138	142	145	148	.....
5 ft. 6 in.....	129	130	131	133	135	138	142	146	149	152	.....
5 ft. 7 in.....	131	133	135	137	139	142	146	150	153	156	.....
5 ft. 8 in.....	135	137	139	141	143	146	150	154	157	161	.....
5 ft. 9 in.....	138	140	142	145	147	150	154	158	161	165	.....
5 ft. 10 in.....	141	143	145	148	151	154	157	161	164	169	.....
5 ft. 11 in.....	145	147	149	151	154	157	160	164	168	173	.....
6 ft.....	150	152	154	156	158	161	163	167	171	176	.....

WEIGHT—HEIGHT—AGE TABLE FOR BOYS

Height Inches	5 Yrs.	6 Yrs.	7 Yrs.	8 Yrs.	9 Yrs.	10 Yrs.	11 Yrs.	12 Yrs.	13 Yrs.	14 Yrs.	15 Yrs.	16 Yrs.	17 Yrs.	18 Yrs.	19 Yrs.
38	34	34													
39	35	35													
40	36	36													
41	38	38	38												
42	39	39	39	39											
43	41	41	41	41											
44	44	44	44	44											
45	46	46	46	46	46										
46	47	48	48	48	48										
47	49	50	50	50	50	50									
48		52	53	53	53	53									
49		55	55	55	55	55	55								
50		57	58	58	58	58	58	58							
51			61	61	61	61	61	61							
52			63	64	64	64	64	64	64						
53			66	67	67	67	67	68	68						
54				70	70	70	70	71	71	72					
55				72	72	73	73	74	74	74					
56				75	76	77	77	77	78	78	80				
57					79	80	81	81	82	83	83				
58					83	81	84	85	85	86	87				
59						87	88	89	89	90	90	90			
60						91	92	92	93	94	95	96			
61							95	96	97	99	100	103	106		
62							100	101	102	103	104	107	111	116	
63							105	106	107	108	110	113	118	123	127
64								109	111	113	115	117	121	126	130
65								114	117	118	120	122	127	131	134
66									119	122	125	128	132	136	139
67									124	128	130	134	136	139	142
68										134	134	137	141	143	147
69										137	139	143	146	149	152
70										143	144	145	148	151	155
71										148	150	151	152	154	159
72											153	155	156	158	163
73											157	160	162	164	167
74											160	164	168	170	171

PREPARED BY BIRD T. BALDWIN, PH.D., AND THOMAS D. WOOD, M.D.

WEIGHT—HEIGHT—AGE TABLE FOR GIRLS

Height Inches	5 Yrs.	6 Yrs.	7 Yrs.	8 Yrs.	9 Yrs.	10 Yrs.	11 Yrs.	12 Yrs.	13 Yrs.	14 Yrs.	15 Yrs.	16 Yrs.	17 Yrs.	18 Yrs.
38	33	33												
39	34	34												
40	36	36	36											
41	37	37	37											
42	39	39	39											
43	41	41	41	41										
44	42	42	42	42										
45	45	45	45	45	45									
46	47	47	47	48	48									
47	49	50	50	50	50	50								
48		52	52	52	52	53	53							
49		54	54	55	55	56	56							
50		56	56	57	58	59	61	62						
51			59	60	61	61	63	65						
52			63	64	64	64	65	67						
53			66	67	67	68	68	69	71					
54				69	70	70	71	71	73					
55				72	74	74	74	75	77	78				
56					76	78	78	79	81	83				
57					80	82	82	82	84	88	92			
58						84	86	86	88	93	96	101		
59						87	90	90	92	96	100	103	104	
60						91	95	95	97	101	105	108	109	111
61							99	100	101	105	108	112	113	116
62							104	105	106	109	113	115	117	118
63								110	110	112	116	117	119	120
64								114	115	117	119	120	122	123
65								118	120	121	122	123	125	126
66									124	124	125	128	129	130
67									128	130	131	133	133	135
68									131	133	135	136	138	138
69										135	137	138	140	142
70										136	138	140	142	144
71										138	140	142	144	145

PREPARED BY BIRD T. BALDWIN, PH.D., AND THOMAS D. WOOD, M.D.

Height and weight charts published by courtesy of the American Child Health Association.

NEW ENGLAND SURGICAL SOCIETY

OBSTRUCTION OF THE COMMON DUCT AMONG 1000 OPERATIONS UPON THE GALL BLADDER AND BILE DUCTS*

BY P. TRUESDALE, M.D., F.A.C.S.

Obstruction of the common duct represents pathology of superlative importance. Whether it is due to stone, infection, cicatrix, cancer or pancreatitis, it interferes with the function of a vital organ, the liver, and commands the most painstaking consideration.

Seventy-five cases of common duct obstruction appear in our records. The cause of obstruction in 37 was stone; in 28 it was found to be Pancreatitis almost equally divided between the acute hemorrhagic and chronic types; in 6 it was cancer of the pancreas, and in four, obstruction was due to traumatic cicatrization of the duct.

Among the cases of stone in the common duct there were four deaths representing an operative mortality of 11%.

While it is not my purpose to treat every phase of the problems dealing with stone in the common duct I wish to reiterate what has been written by numerous authors, first the need of examining the common duct digitally when the sound fails to locate a stone in the presence of convincing clinical evidence of obstruction by stone such as intermittent attacks of pain, chills, fever and jaundice, the temperature being of the "angle" type and the jaundice remitting. In the last analysis the finger is the only trustworthy instrument for examination of the common duct. Its use in the following situation might have changed the issue.

Case I. R. M., No. 11419. Female, age 24 yrs. Present illness of eight months' duration, in which period she had three acute attacks characterized by colicky pain in the upper abdomen radiating to the right subscapula region, nausea and slight fever, jaundice and bile stained urine. Present attack began three days before admission to the hospital and was unusually severe. Physical examination revealed moderate jaundice, full soft tympanitic abdomen and tenderness marked in the right upper quadrant. Upon examination through a right rectus incision the gall bladder was found acutely inflamed and contained many stones. It was removed as were also several small stones from the cystic duct. The common duct was examined along its course and probed repeatedly without the discovery of a stone. We believed the sound passed into the duodenum. A drainage tube was inserted in the duct and the operation terminated. The immediate recovery was satisfactory but vomiting began on the third day and continued. Stomach lavage and medication failed to control this symptom. A duodenal tube would not pass the pylorus. From the sinus both bile and pancreatic juice escaped resulting in excoriation of the skin over a wide area. Although at one time the patient felt well enough to sit up in a wheel chair, vomiting and drainage continued until her strength began to fail rapidly and she died, seventeen days after operation. Autopsy revealed a stone at the very end of the common duct. The probable cause of the persistent vomiting was thus brought to light. The flow of all bile and pancreatic juice to the surface of the abdomen was explained by the opening of the pancreatic duct just above the site of the common duct stone. This diversion of all secretions from the liver and pancreas deprived the first portion of the duodenum of its alkaline state known to be essential for the relaxation and opening of the pylorus. It accounted also for the inability of the duodenal tube to pass through the pylorus.

The second picture of importance is that first noticed by Courvoisier whose statement has been termed Courvoisier's law, that in cases of chronic jaundice due to obstruction of the common duct, a contraction of the gall bladder signifies that the obstruction is due to stone; a dilatation of the gall bladder that the obstruction is due to cancer at the head of the pancreas. As with most laws this one has its exceptions. In several instances we have observed the gall bladder to be enlarged in the presence of common duct stone causing jaundice. Furthermore, the enlargement of the head of the pancreas acting as an obstruction of the common duct is not always due to cancer. It may be and often is caused by chronic pancreatitis. However, Courvoisier's law is a very dependable guide in the pathology of this region. If one fails to respect it duly, he may be in a position of embarrassment, as I found myself during the following operation.

Case II. M. M., No. 11744. Female, age 46 years. Attack of five weeks' duration consisting of cramplike pain across the upper abdomen not radiating and coming only at night. Jaundice appeared early and continued to the date of admission. No vomiting, chills but not severe.

Upon examination there was a well marked degree of jaundice. The upper abdomen was distended and tender. An enlarged gall bladder could be outlined in the right upper quadrant. The clinical evidence appeared to warrant a surgical examination which was made through a right rectus incision. The gall bladder was greatly distended and contained stones. The cystic and common duct were also dilated. A hard mass was felt at the lower end of the common duct. Although it was fixed it was thought

*Read at the annual meeting of the New England Surgical Society, Springfield, Mass., October 2, 1925.

to be stone. The gall bladder was removed. The common duct was incised and examined digitally for stone. None was found. Instead, the indurated mass proved to be the head of the pancreas. We then believed the condition to be cancer of the head of the pancreas and wished the gall baldder had been left for anastamosis with the intestine. However, a rubber tube was placed in the common duct. Five months have elapsed and the patient is perfectly well. So, in all likelihood, the mass in the head of the pancreas was inflammatory.

My third comment in dealing with stone in the common duct is the indispensability of a good exposure of the duct during operation, especially of its second and third portions. The method of rotating the liver and elevating the duct by incising the peritoneum and lifting the duodenum as described by Moynihan (Abdominal Operations p. 331) is practical and most helpful. The inaccessibility of the common duct more often than any other factor explains why the chief offender among the stones in this passage is left and the others removed.

Throughout our experience while operating in this region, it is no exaggeration to state that the major portion of our trials and adversities has happened in the common duct series. In order that the sources of danger may be accurately traced we have been impressed with the importance of determining the true state of the pancreas and liver.

So we have come to regard the common bile duct as a deep seated channel encroached upon by a variety of disorders taxing the knowledge and resources of the average surgeon frequently to and occasionally beyond the limits of his learning and resources.

One needs be mindful of the hidden pathology which interferes with the normal flow of bile into the duodenum. It is not a review of our successful results which has engulfed our pride and prompted this examination of our records. Our most valuable lessons have been learned at the autopsy table where examination has exposed the more concealed but nevertheless real causes of failure. For example:

Case III. *History:* W. A. W., No. 12245, Male, age 54 yrs. School teacher. Admitted Sept. 4, 1925. On August 31 an acute attack of upper abdominal pain was ushered in with nausea, vomiting, chill, fever and jaundice. He had suffered a somewhat similar attack six weeks previous. On September 1 his physician urged him to go to the hospital but believing the attack would subside as did the one of recent date, he declined to be moved. The following day his condition was somewhat better and no change of a serious nature occurred until September 3rd, when the acute symptoms recurred causing his attendants considerable anxiety. He decided to go to the hospital on the following day if his condition failed to improve. So he was admitted on September 4th and operated upon September 5th, 1925. In 1923 we had operated upon this patient for a perforated appendix with peritonitis. At that time we palpated the gall bladder and found it to contain stones.

The pre-operative diagnosis in this instance was cholelithiasis with a question of acute pancreatitis. Examination through a right rectus incision revealed an active inflammatory process involving the region of the gall bladder and bile passages. The gall bladder was much enlarged and contained many stones. The common duct was also dilated with an indurated mass at the ampulla thought to be stone or enlarged head of the pancreas. Areas of fat necrosis were not discernible. In making a search for this sign we hesitated to disturb the omentum so extensive and firm were the omental adhesions. The consequent bleeding associated with jaundice did not appear inviting. Therefore, the gall bladder was removed. The cystic duct was dilated and its walls thickened. For the moment this aroused our suspicions but we continued and explored the common duct through the dilated stump of the cystic duct. Failing to find a stone, the common duct was opened liberally. Thick dark bile escaped in quantity. The duct was then explored to the duodenal end with the finger. It was found to be empty. Had the stone escaped? Probably not. It seldom does. The nodes we felt were still present and could be made out definitely as the head of the pancreas. We completed the operation by inserting a tube into the hepatic duct.

The patient died on the fifth day after operation. Autopsy exposed the real cause of death —Acute hemorrhagic Pancreatitis. Areas of fat necrosis were limited to the underside of the meso-colon.

We have occasion to regret (1st) that this patient would not be operated upon until the eighth day of his attack; (2nd) that in order to expose the only area where fat necrosis appeared it would have been necessary to separate adhesions and cause bleeding in the presence of a marked degree of jaundice; (3rd) that we failed to interpret the true significance of Courcoisier's law: An enlarged gall bladder without stone in the common duct in the presence of increasing jaundice is due to pressure outside the common duct; (4th) that we were misguided by the presence of stones in the gall bladder and the absence of areas of fat necrosis in this region and failed to explore the body of the Pancreas. Although loath to accept cholangitis and chronic induration of the head of the pancreas as a cause of the jaundice we did so, in spite of the fact that acute hemorrhagic pancreatitis was mentioned in the provisional diag-

nosis. So we drained the common duct. We had done so before under conditions almost similar and the patients recovered. But not in this case, bile drainage was scanty. Jaundice increased. Damage to the pancreas was in lethal measure.

Was the following case, antedating the one above by a few months only, another of infection of the Pancreas only in milder form? And were we guided in the former case by the influence of success in this one?

Case IV. W. E. D., No. 10615. Male, aged 61 yrs. Admitted to the hospital October 1, 1924. Considered himself well up to the present illness which began in June with a feeling of distress in epigastrium, vomiting and a very mild degree of jaundice. Attack lasted a few days. Two weeks before admission another attack was ushered in with a chill, abdominal distress, nausea and vomiting. There was no acute pain, jaundice appeared and has continued. Weight 208 lbs. No loss in three months. Upon admission his temperature was 104, pulse 110, and resp. 31, skin, sclera and urine indicated a moderate degree of jaundice. Abdomen appeared expansive and distended. Tenderness across the upper arc was more marked under the right costal border. Otherwise physical examination revealed no signs of importance. Leukocyte count was 17000: 80% polynuclears. Roentgenogram revealed a shadow in the region of the gall bladder and interpreted as stone.

The patient refused operation and remained under medical treatment for two weeks. During this period he had two attacks each beginning with a chill and epigastric distress. There was no acute pain but jaundice deepened.

On October 14, an operation was done. The gall bladder was enlarged and contained many small stones. The common duct was dilated but we did not find a stone in its lumen. The head of the pancreas was noticeably enlarged and indurated. There was no area of fat necrosis seen. A rubber tube was inserted in the common duct. This patient made an uninterrupted recovery and has remained well for nearly a year.

These two cases are not clinically identical yet the symptoms and signs are analagous in many respects. The treatment which was adequate to save one was too conservative to check the other, because of the great difference in the degree of infection of the pancreas. In the presence of acute symptoms both subjective and objective, enlargement of the head of the pancreas and dilated bile passages, one should not be satisfied with the absence of areas of fat necrosis in this field, although this diagnostic sign appeared somewhere in the gall bladder field in every one of our acute hemorrhagic cases except one. In such a situation I wish to stress the importance of turning the omentum and colon upward, and examining the under surface of the meso-colon. In the first of these two cases we might have been rewarded if we had exposed the patient to a little more danger from hemorrhage in order to reveal the crucial evidence of pancreatic destruction.

There were four cases of traumatic obstruction of the common duct. They represent our own accidents. In each instance the application of a clamp wholly or partially across the common duct ocurred during the operation of cholecystectomy. The conditions which augmented the liability of this mishap were three: (1) short thick cystic duct; (2) difficult exposure and (3) sudden, violent hemorrhage during the operation. The latter was the cause in three of the four cases. Two of the four patients died following the reconstructive operation.

In the group of cases involving the diseased pancreas as a cause of obstruction of the common duct there were 36. Fourteen were acute hemorrhagic pancreatitis, sixteen were due to chronic pancreatitis and six were attributed to cancer of the pancreas. Upon investigation it was found that three cases were reported as cancer during operation, while the subsequent history indicated that they were cases of chronic pancreatitis, for one lived eight years, a second lived twelve years and the third is living and well after about six months. Final decision in the latter case must be reserved.

One case termed chronic pancreatitis in the records died eight months later probably from cancer of the pancreas. The remaining six cases recorded as cancer were proved at autopsy or the short period of life following operation. I have no confidence in my ability to differentiate always with accuracy cancer of the head of the pancreas from chronic pancreatitis. Very often it is not difficult. Occasionally it is impossible. Besides, to remove a section from friable, vascular tissue invites trouble.

The cases of acute hemorrhagic pancreatitis, fourteen in number form an interesting group. Every case in both the acute and chronic forms of pancreatitis was associated with the presence of gall stones. In only two cases were stones found in the common duct. Both of these were among the chronic cases. Therefore, we found at operation that pancreatitis was associated with, if not directly secondary to, cholelithiasis in 100% of the cases. The location of the stones appears to have no special significance. One would naturally expect infections of the pancreas to be more frequent in the common duct series where cholangitis is caused so often by the presence of stone. If the avenue of infection in pancreatitis was along the ducts this association would exist. The evidence points to other channels bearing out the opinion of

Graham, Whipple, Jones and others that infection of the pancreas takes place by way of the lymphatic vessels.

To take the view that pancreatitis is either of the acute hemorrhagic type or chronic, probably indicates failure to visualize the intermediate changes of an inflammatory nature. Chronic pancreatitis is likely to be the result of several mild attacks of acute or sub-acute inflammation. It is also reasonable to presume that acute pancreatitis of moderate severity occurs and is followed by recovery instead of a sudden change to the hemorrhagic form. The attendant always needs be on the alert in the severe cases of suspected gall-stone colic with jaundice lest the visitation of hemorrhagic pancreatitis promptly wipes out the chances of recovery. In 14 cases of the hemorrhagic type we lost 5, a mortality of 36%.

Although most authors agree that pancreatitis in its various forms is a result of infection there is a difference of opinion as to the manner of development of the hemorrhagic and inflammatory process. Mayo Robeson (*Lancet,* 1904 i 773) described two classifications. One with sudden and violent onset accompanied by collapse and ending fatally in a very short time being chiefly those where the hemorrhage precedes the inflammation while the milder but still acute cases where resolution and relapse occur the inflammation precedes the hemorrhage. It appears that the latter form is probably more common and it is among this class that operation promptly and judiciously carried out brings about an immediate control of the disease.

Finally, the outstanding impression one receives from a study of these seventy-five cases of common duct obstruction is that in 69 or more than 92% the cause of such dangerous infections was a preventable one. Nine deaths occurred because of the unnecessary tax placed upon the endurance of the patient and the skill and resources of the surgeon. More accurate determination of liver function, no doubt will reduce this mortality rate.

However, this is the era of preventive medicine. More has been accomplished by its agency during the first quarter of the present century than by more feeble doctrines used in the previous two thousand years. As for the dangers from the hazardous terminal complications of cholelithiasis, have they been recognized and given their full measure of publicity? I believe that this has not been done, although common duct stones and pancreatitis are recognized more often today than they were 25 years ago. Tuberculosis, cancer, typhoid fever, diphtheria, scarlet fever, tetanus, venereal and other diseases have been met and controlled by preventive measures, but very little is said to the patient with gall stones about their potential pernicious possibilities. It is to be hoped that other statistics based on a study of the serious dangers from the later complications of gall stone disease will encourage practitioners of medicine and surgery to give such enlightment to patients suffering from gall stones that will induce them to select a period for operation when the operative risk is a little more than 2% instead of 16%.

DR. SAMUEL B. WOODWARD TELLS ABOUT VACCINATION AND THE SMALLPOX EPIDEMIC IN WOONSOCKET

To the Editor of The Gazette:

Sir:—George W. Reid suggested in a forum letter a few days ago that the believers in vaccination might tell him whether the children ill with smallpox in St. Francis Orphanage, Woonsocket, had or had not been vaccinated, thinking very properly that, as they were all under the age of 12, vaccination, if it had been done, would be necessarily approximately fresh and should therefore be protective.

I am pleased to inform him that Dr. William A. Bernard, Health Officer of the town, and Dr. B. O. Richards, Executive Secretary of the Rhode Island State Board of Health, in answer to my inquiries state that there were 240 children in the orphanage, that approximately 120 had been vaccinated, that of the original 14 victims, one sister and 13 children, not one had ever been vaccinated, that four more children now have the disease, all from the unvaccinated 120, and that no child who had ever been vaccinated has smallpox, although these children have mingled freely with those affected.

All children have now been vaccinated and if no more cases occur before next Wednesday, when these vaccinations become effective, health officers expect no more trouble.

Any further information along this line that can be obtained I shall be very glad to make public.

Vaccination seems to have protected the lucky 120 most effectually and the incident is a strong argument for parochial and private school compulsory vaccination, which in New York city and the largest cities in that state has prevented and will prevent any such unpleasant incident as Woonsocket is now contending with. Samuel B. Woodward.—*Worcester Gazette.*

THE WORLD'S CHILDREN

Health Service for Preschool Children, New York

The Mulberry Health Center, New York City, has for six years maintained a health clinic for the periodical examination of preschool children and a staff of nurses for follow-up work in the homes. The center has analyzed its expenditures and now reports that this service costs, on the average, $2.22 per child.

Case Records of the Massachusetts General Hospital

ANTE-MORTEM AND POST-MORTEM RECORDS AS USED IN WEEKLY CLINICO-PATHOLOGICAL EXERCISES

EDITED BY
RICHARD C. CABOT, M.D., AND HUGH CABOT, M.D.
F. M. PAINTER, A.B., ASSISTANT EDITOR

CASE 11471

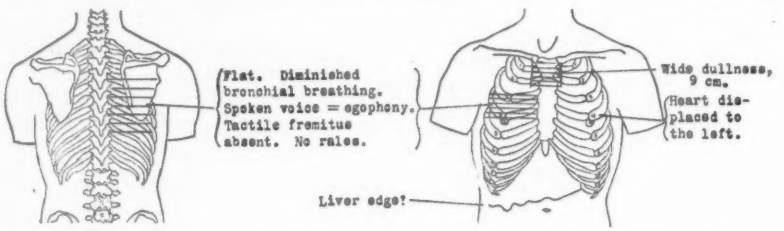
MEDICAL DEPARTMENT

AN English butler of fifty-five was sent from the Emergency Ward June 11, so ill that no past history was taken. The chief complaint was pressure beneath the sternum.

Ten weeks before admission when apparently in good health he caught a severe cold and had malaise, cough and fatigue. He kept on with his work and seemed to be recovering, when he began to feel weak, tired, generally run down, and to lose weight and strength. The cough began again and increased. There was some whitish sputum. He lost appetite and at admission was entirely indifferent to food. He had some regurgitation but no real vomiting. For six weeks he had been hoarse. Six weeks before admission he began to have difficulty in swallowing solid food, increasing until he could now take only liquids and those only by determined efforts, without which he regurgitated with mild coughing. During the past six weeks he had had five or six short violent twinges of pain in the right chest radiating to the right shoulder and scapula. Four weeks before admission coughing became difficult and painful. Since the onset he had had increased dyspnea. At present he was completely exhausted. He could not climb more than one flight of stairs. In two months he had lost ten pounds. He had had sweating after paroxysms of coughing. He did not sleep well. His bowels had been markedly constipated, especially during the past two weeks. June 6 he was given an X-ray treatment over the chest lasting twenty minutes.

Examination showed a haggard, washed-out, sick and uncomfortable looking man, dyspneic, orthopneic and slightly hoarse, with a dry wheezing cough especially related to the effort of talking. The skin and mucous membranes were slightly cyanotic. The teeth were false. In the right supraclavicular region was a medium sized hard immovable gland. The heart was displaced to the left. The apex impulse was felt in the fifth space 12 cm. to the left, coinciding with the left border of dullness 3.5 cm. outside the midclavicular line. The right border of dullness was 1.5 cm. to the right. The supracardiac dullness was 9 cm. The sounds and action were normal. The pulmonic second sound was audible. There were no murmurs. The blood pressure was 135/85 left, 120/95 right. The lung signs and liver edge were as shown in the diagram. There was tenderness in the right upper quadrant. The abdomen was difficult to palpate because of rigidity.

The temperature was 97° to 102.2°, the pulse 90 to 135, the respiration 20 to 36 with a terminal rise to 40. The amount of urine was normal on the four days recorded, specific gravity 1.024 to 1.014, rare to occasional leucocytes at all examinations. The hemoglobin was 70 per cent., the leucocyte count 17,900 to 30,400, the polynuclears 80 to 98 per cent., the reds 3,100,000 to 4,600,000; two of four smears showed moderate variation in size and shape, one showed slight polychromatophilia. The platelets were always slightly to moderately increased. A Wasserman was negative. X-ray June 26 showed the entire right chest distinctly less radiant than normal. The density was of a homogeneous character and obliterated the outline of the diaphragm, the lung markings and the inner margins of the root shadows. The heart and mediastinal shadows were displaced somewhat to the left, also the shadow of the trachea. There was a large dense shadow to the left of the arch which apparently represented a mass of enlarged glands about the left hilus.


Flat. Diminished bronchial breathing. Spoken voice = egophony. Tactile fremitus absent. No rales.
Wide dullness, 9 cm.
Heart displaced to the left.
Liver edge?

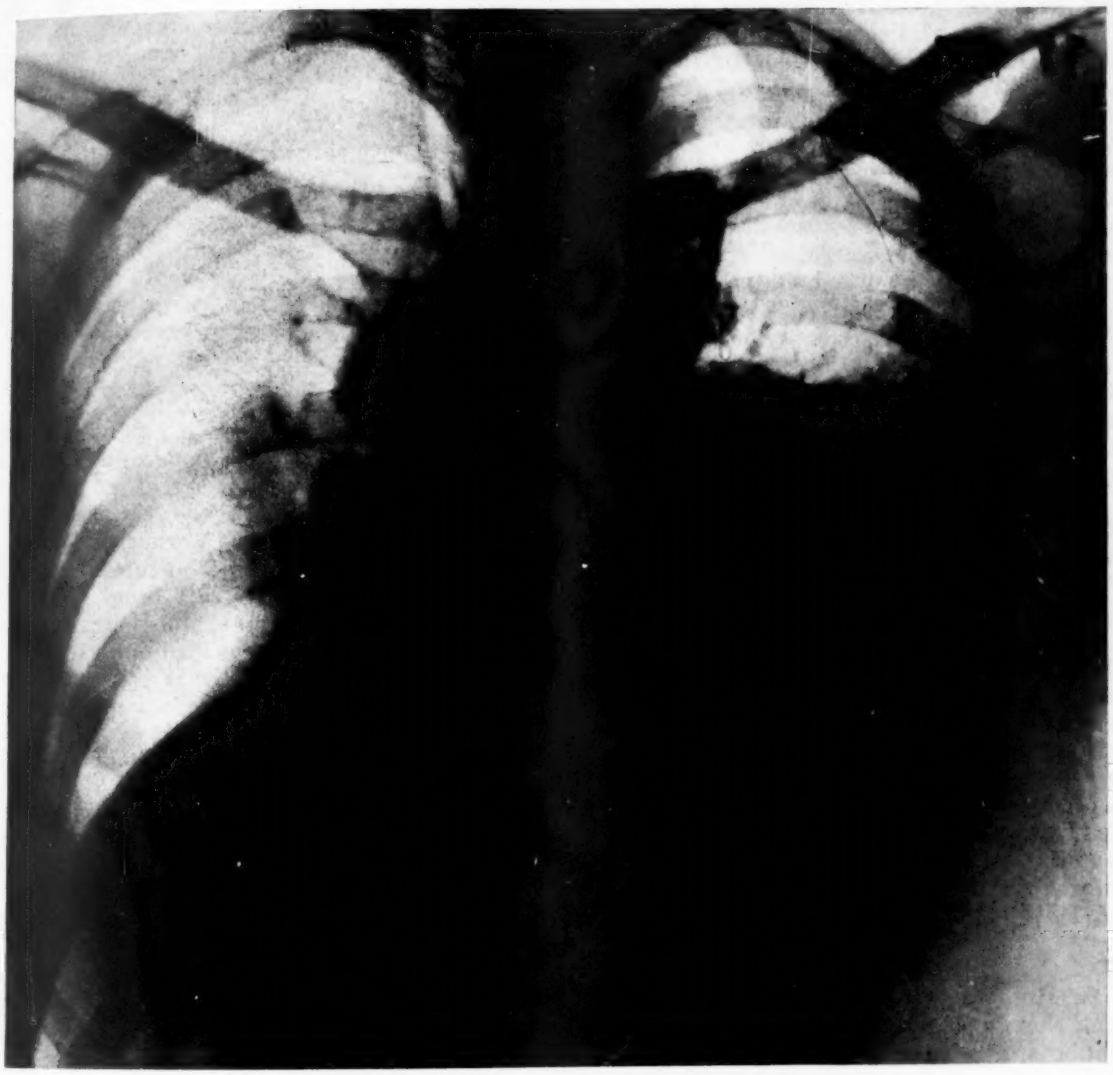
In view of the previous X-ray treatment further radiotherapy was postponed for a few days after admission for fear of producing an X-ray burn. June 19 another deep X-ray treatment was given through the back. That night the patient felt ill. He was carried along on morphia. June 22 he was given another X-ray treatment. The symptoms improved, but there was a steady gradual rise of pulse. The patient would not eat. July 9, after more than a month of X-ray treatment, another X-ray examination showed very little change since the previous observation; if anything the process was a little more marked. The pulse improved, reaching 110 July 13. The leucocyte count, which had risen during the X-ray treatment, now fell off.

From this point however the patient became worse. He had dry irritating cough requiring increasing doses of morphia. A gland in the right supraclavicular region became a hard nodular mass as large as a man's fist. July 23 he died.

The diagram means fluid in the right chest in all probability connected with a tumor.

A PHYSICIAN: How do they distinguish between displacement and hypertrophy of the heart?

DR. CABOT: They have to distinguish it



The entire right chest is distinctly less radiant than normal. The density is of a homogeneous character and obliterates the outline of the diaphragm, the lung markings and the inner margins of the root shadows. The striking thing is the radiating lines extending out into the lung fields. The heart and mediastinal shadows are displaced somewhat to the left, also the shadow of the trachea. There is a large dense shadow to the left of the arch which apparently represents a mass of enlarged glands about the left hilus.

DISCUSSION

BY DR. RICHARD C. CABOT

NOTES ON THE HISTORY

It is evident that somebody thought this man had malignant disease.

NOTES ON THE PHYSICAL EXAMINATION

The immovable gland is the most definite physical evidence obtained up to this point.

The supracardiac dullness of course is increased.

The blood pressure findings are normal.

either by X-ray showing its position or else by percussion of the right border. Here they said "displaced" I think because they had made up their minds that there was fluid in the right chest. Then they found the left heart border out and said the two belonged together. Otherwise I don't think they could have had scientific evidence of that.

Whether this irregularity of the liver edge in the diagram is meant seriously or is just a little artistic tremor of the pencil I don't know. It looks as if they intended it. It is one of the things we cannot be sure of.

DR. HOLMES: We have a plate taken on June 11. It shows a variation from the normal on the right which involves the greater part of the right chest. The striking thing about it is the radiating lines extending out into the lung field. It is not the characteristic picture of fluid. In fluid the upper border of the dull area should be quite smooth and sharply defined and should rise higher in the axillae than in the median line. In this case it fades off, and running up are these radiating lines.

The heart shadow is well over to the left, we should not be able to say whether due to a marked enlargement or to displacement. We suspect displacement because the great vessels are also over.

The left lung is normal and the apices are clear.

In the second plate we see a marked increase in the process. The dullness now involves the entire right chest and is probably fluid. The heart is well over and the great vessels are also displaced. Here we can state nothing except the large amount of fluid.

The first picture suggests fluid and some process involving the lung itself, and the character of the lines suggests a malignant process extending outward into the lung.

DIFFERENTIAL DIAGNOSIS

DR. CABOT: The only interesting question is, what else is there besides malignant disease of the right lung with fluid? We had earlier fever and leucocytosis, which might suggest pneumonia and bronchiectasis, but towards the end we did not hear so much of that. I do not believe I can state the cause of that fever and leucocytosis. It might have been associated with the breaking down of tissue from X-ray therapy.

A PHYSICIAN: Why didn't they aspirate the chest?

DR. CABOT: I do not know why.

DR. HOLMES: In connection with the treatment they probably thought of Hodgkin's or lymphosarcoma. So far as the X-ray picture goes no definite interpretation could be made. The fact that it showed no response to X-ray would indicate that it was carcinoma rather than Hodgkin's.

DR. CABOT: Hodgkin's gives way to X-ray more than any other tumor, doesn't it?

DR. HOLMES: Yes.

X-RAY INTERPRETATION

The findings are those of extensive enlargement of the hilus glands, probably malignant, with accumulation of fluid in the right chest.

CLINICAL DIAGNOSIS (FROM HOSPITAL RECORD)

Mediastinal malignancy.

DR. RICHARD C. CABOT'S DIAGNOSIS

Malignant disease of the right lung, with fluid.

ANATOMICAL DIAGNOSIS

1. *Primary fatal lesion*

   Malignant tumor of mediastinum with metastases in the lungs and cervical lymph glands.

2. *Secondary or terminal lesions*

   Bronchopneumonia, with abscesses and chronic pneumonia of the right lung.
   Edema of the left lung.
   Purulent bronchitis, right.
   Hydropericardium.
   Hydrothorax.
   Chronic passive congestion, general.
   Chronic perihepatitis and splenitis.
   Arteriosclerosis of aorta.

3. *Historical landmarks*

   Chronic pleuritis.

DR. RICHARDSON: He was a poorly nourished man. He had a huge mass of new-growth tissue in his mediastinum and an extension from that into the lungs and into the cervical lymph glands. There was some bronchopneumonia with abscesses and chronic pneumonia of the right lung; edema of the left lung. Purulent bronchitis was on the right, and there was some constriction of the bronchus leading to that lung. The mass extended up so that it presented about midway of the right clavicle, rounding up under the skin as a firm nodular mass six by five by two and a half cm., simply a prolongation from the mass in the mediastinum.

Histologically the tumor seemed to be like carcinoma or neuroblastoma. It was a malignant growth; it was impossible to state definitely its origin.

DR. HOLMES: The neuroblastomas do respond to radiation to some extent, whereas the carcinomas do not.

DR. RICHARDSON: The tissue of the new growth was on the whole very firm, grayish and not soft or broken down.

CASE 11472

MEDICAL DEPARTMENT

A machinist of twenty-one of Russian Jewish descent entered October 6 complaining of weakness, lethargy and hematuria. The history was given by his mother. He was very bashful and uncomplaining and talked little. One sister died of "tuberculosis of the ovary." The patient had influenza at thirteen, during an epidemic. He had occasional tonsillitis. He was troubled with much gas.

Three years before admission his face, conjunctival sacs, ankles and legs became swollen and his vision blurred. He had marked frequency day and night and marked enuresis.

His blood pressure was 240/? His urine showed a large amount of albumin. He was very weak and was in bed nine months. The edema gradually subsided and he began to walk about, but seemed to be slowly going downhill. A year after the onset he had marked frequency and elevation of blood pressure. He refused to stay in bed and follow treatment. His face was not swollen but was "saggy." He felt weak and tired. The urine again showed albumin. Four months before admission he had "yellow jaundice" which cleared up spontaneously in three or four weeks. His blood pressure was reported as 215/? Four days before admission he had a slight cold in the head, with slight fever and loose watery movements. The urine showed albumin. The systolic blood pressure was 205. He was put to bed. During the next twenty-four hours he passed three pints of red urine and complained of constant general abdominal pain, not radiating. He took only very soft foods, subsisting chiefly on milk and water. He was dull and sleepy. His breathing was rather deep and slow. October 4 he vomited some milk of magnesia. The enuresis, frequency and hematuria continued. He had hiccup after eating. For some time before his admission he had had slight dyspnea and palpitation on exertion.

Examination showed a rather poorly nourished, pasty, anemic looking boy with markedly ammoniacal breath. He was not mentally clouded. The skin was dry. There was pyorrhea. The mouth was dry, the throat red. The tonsils were poorly seen. An occasional râle was heard at the bases of the lungs. The apex impulse of the heart was seen and felt in the fifth space 11 cm. to the left of midsternum, coinciding with the left border of dullness 2½ cm. outside the midclavicular line. The right border of dullness was 3 cm., the supracardiac dullness 6 cm. The sounds and action were normal. The aortic second sound was accentuated and snapping. The action was rapid. There was a slight systolic murmur at the apex. The artery walls were thick and hard, the brachials tortuous. The blood pressure was 220/170-160/100. He resisted examination of the abdomen. Rectal examination was negative. The right pupil was greater than the left, otherwise the pupils and reflexes were normal. The legs showed very slight edema. The fundi were normal except for slight edema of both discs.

The temperature was 99.8° to 98.4°, the pulse 138 to 115, the respiration 20 to 36. The urine was red at one of two examinations, the specific gravity 1.012, the amount not recorded. There was a large trace to a trace of albumin at both of two examinations. The sediment was loaded with red blood corpuscles at both and with leucocytes at one. The second showed 50 leucocytes per high power field. The renal function was zero. The blood at entrance showed 80 per cent. hemoglobin, 3,800,000 reds with some achromia, no abnormal variation in size or shape. The platelets seemed decreased. There were 92 per cent. polynuclears. October 8 after bleeding 600 c.c. the hemoglobin was 55 per cent., the reds 3,400,000, the leucocytes 24,000. A Wassermann was negative. October 7 the non-protein nitrogen was 195 mgm., the uric acid 6.1, the creatinin 8.45, all fasting. October 8 after the removal of 600 c.c. of blood the non-protein nitrogen was 235, the uric acid 7.2, the creatinin 9.5.

The night of October 7 the patient was very ill. The following morning he showed the picture of moderate to severe pulmonary edema. There was definite pulsus alternans. The blood pressure was 180/130. Atropin 1/100 and morphia 1/8 were given and 600 c.c. of blood withdrawn. After it the blood pressure fell to 150/100 and the patient felt weak, but two hours later was much better and the râles seemed somewhat decreased. He was comfortable all that day without morphia. The diastolic blood pressure fell to 90; the systolic was 170. Almost complete anuria followed the bleeding. At noon he was catheterized and 2½ ounces of urine withdrawn. That night the pulmonary edema again began to cause symptoms and the lungs filled with large bubbling râles. The patient became very lethargic, with occasional lapses into delirium. By 10 p. m. twelve grains of digifolin had been given. He grew worse. Early the next morning he went into convulsions and died.

Discussion

BY DR. MAURICE FREMONT-SMITH

I was not aware that one died of tuberculosis of the ovary. I suppose the interpretation must be tuberculous salpingitis and peritonitis. The sister may or may not have had tuberculosis of the lungs, and of course this point is the interesting one in her connection with her brother's present illness.

The attack three years ago sounds like one of acute nephritis. The blood pressure of 240, however, if accurate, would make us assume that this was in fact an acute exacerbation of a chronic nephritis. I have never seen a very high blood pressure in acute nephritis unless there was a chronic background. It would be interesting to know what the urine picture was between the attacks, and also what the blood pressure reading was. 215 systolic is an extremely high blood pressure for nephritis of any type. I have seen it in the nephritis of lead poisoning, but such high readings are far more frequent in cases of essential hypertension without evident kidney damage.

Massive hematuria can occur in acute nephritis, although it is rare. Its presence always

makes us think rather of the possibility of stone, tuberculosis, or tumor of the kidney. Pain in the lower back does occur in acute nephritis with massive blood in the urine. I suppose the explanation must be the stretching of the kidney capsule. In no other type of nephritis have I ever seen pain in the back.

Abdominal pain occurs in uremia frequently, and together with the usual accompanying symptoms of nausea and vomiting is frequently diagnosed obstruction of the bowel when such does not exist. Hiccup is likewise suggestive of uremia. The dyspnea is either toxic in type, that is the respiratory center is abnormally stimulated by poison not excreted through the kidneys, or else is due to a progressive failure of the heart under the strain of prolonged high blood pressure.

Physical examination tells us little that we have not already learned from the history. The heart is enlarged, as we should expect. The diastolic blood pressure is as high as I have ever seen it recorded. Pupillary inequality may occur in uremia. The leucocytes in the urinary sediment are consistent with a subacute nephritis. I am astonished that the hemoglobin could register 80%. I do not know which to doubt most, the 80% hemoglobin or the achromia in the red cells. I have found the Tallqvist hemoglobins consistently undependable excepting as indicating a comparatively normal hemoglobin or one markedly low. I was interested in Dr. Cabot's statement the other day that a 70% hemoglobin was rare. Strangely enough I suppose eight out of ten of my patients show 70% on the Tallqvist scale. This reading I usually consider within normal limits. I have found, too, in examining blood smears that unless achromia be marked it is of little value in helping to diagnose a moderate grade of anemia. If this be a case of chronic nephritis, as we have every reason to believe, I doubt very much whether the hemoglobin could have been 80%. The 92% polynuclears suggests pyogenic infection, as does the 24,000 leucocyte count, although we know that a 12,000 to 14,000 count often occurs in secondary anemia without infection.

Of course the non-protein nitrogen of 195 makes the diagnosis of uremia. A point that I have recently learned is that actual uremia with coma and even convulsions may occur with no rise in the non-protein nitrogen. According to our laboratory test the removal of the blood from this patient did not improve conditions, but I should like to know whether he was symptomatically benefited, as is so often the rule in these cases after bleeding. As we read further this seems to have been the case.

I cannot imagine the rationale of giving digifolin to a patient in this condition. I should feel that the doctor's duty was to leave the patient alone at this stage.

The whole question of uremia is as yet unexplained. Why, after the removal of both kidneys in an animal or an only remaining kidney in a human, will the non-protein nitrogen rise to great heights without the appearance of convulsions? Why may convulsions occur and the kidney show a low function without any rise in the non-protein nitrogen? Why in some cases of nephritis do we have edema and in others none, the first group being less likely to develop uremia? Why do we find a case showing edema early, later on going into uremia without edema, or with only a slight edema as in this case? What substances really throw a load on the kidneys? Does the forcing of fluids or the giving of high protein or moderately high protein diet strain the excretory power of the kidney? All these are questions for the physiologists, but are of such practical bearing that we as physicians are constantly awaiting the answer.

I expect to find in this case kidneys showing no marked diminution of size, but evidence of a chronic and probably an acute nephritis, diffuse, involving glomeruli more than tubules. We shall find a big flabby heart, probably without pathological evidence of myocardial damage. We may find fluid in one or more of the body cavities, edema of the lungs and perhaps of the brain and the dependent parts of the body. We shall probably find some evidence of arteriosclerosis as the result of the long continued high blood pressure.

CLINICAL DIAGNOSIS (FROM HOSPITAL RECORD)

Chronic nephritis.
Uremia.
Acute pulmonary edema.
Venesection.

DR. MAURICE FREMONT-SMITH'S DIAGNOSIS

Chronic nephritis.
Uremia.
Pulmonary edema.
Hypertrophied heart.
Arteriosclerosis?

ANATOMICAL DIAGNOSIS

1. *Primary fatal lesion*

Chronic glomerulonephritis.

2. *Secondary or terminal lesions*

Hypertrophy and dilatation of the heart.
Chronic passive congestion.

3. *Historical landmarks*

Obsolete tuberculosis of a mesenteric lymph node.

DR. RICHARDSON: The head was not examined.

The skin generally was rather sallow, with some faint brownish tinging in places. There was subcutaneous fat in small amount.

The gastro-intestinal tract showed a slight amount of passive congestion but was otherwise negative.

Mesenteric glands: There was one slightly enlarged fibrocalcareous degenerated gland 2 cm. in diameter.

The liver was 4 cm. below the costal border. The diaphragm was at the fifth rib on the right, the sixth rib on the left.

The trachea and bronchi contained much thin brownish red frothy fluid.

The lung tissue showed much passive congestion.

The heart weighed 535 grams, much enlarged. The myocardium was generally thick, of good consistence and pinkish brown red. The right ventricular wall was 4 mm., the left 14 mm. The columnae carneae were well marked. Cavities: left, full size; right, moderate dilatation. The foramen ovale was closed. The ears were negative. The valve circumferences were mitral 10 cm., aortic 6 cm., tricuspid 13 cm., pulmonary 7½ cm. The valves were negative. The coronaries were free and negative. The aorta, pulmonary artery, veins and venae cavae were negative.

The liver was of good size and showed some passive congestion.

The spleen was slightly enlarged, the surface smooth, the tissue dark brown red, rather elastic—passive congestion.

The kidneys combined weighed 155 grams, very small. The capsules stripped readily and the surfaces generally were pale and finely granular. The tissue was rather tough, with brown-red pyramids and pale cortex. The cortical regions were the site of innumerable small grayish areas and streaks. The markings were very indistinct. The zone between the cortex and the pyramids was indistinct and the cortex varied from 3 to 5 mm. The pelves and ureters were negative. The kidney sections showed increase of the interstitial tissue with atrophy and diminution of the tubular elements. Glomeruli were extensively involved, many of them showing atrophy, and some of them were large, lobulated and with obliteration of the capillaries and some capsule proliferation.

There was sclerosis of many of the arteries.

A well marked case of chronic glomerulonephritis with hypertrophy and dilatation of the heart and chronic passive congestion.

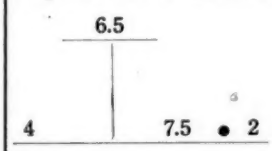
CASE 11473

Surgical Department

A man of thirty-nine entered for the first time September 24. One sister died of tuberculosis. He had always been well and strong and could not remember ever being ill in bed before. He had possible gonorrhea at twenty-four. At one time he took four or five drinks of whiskey or gin every Saturday night. Five years before admission he weighed 142 pounds, his best and usual weight. He had lost fifteen pounds in the past two months.

Two months before admission his skin became yellow, his urine dark colored and his stools gray. A week later his skin began to itch all over and the jaundice increased to deep yellow. Soon after the itching began he lost all appetite and felt nauseated at the sight or thought of food. He vomited seven or eight times immediately after eating, yellow vomitus containing only food just eaten. During the past six weeks there had been very little vomiting, the last a week ago. He had considerable belching of gas and some epigastric discomfort after eating. The color of the skin and the urine had varied; the urine now was as dark as it ever had been, the skin much lighter than it was seven weeks earlier. During the past two nights he had sweat a little. The itching had been his most disturbing symptom, keeping him awake practically every night for the past five weeks. He had worked until the day before admission.

Examination showed a rather poorly nourished man with dry, slightly jaundiced skin and jaundiced sclerae. Lungs clear. Apex impulse of heart not found. Sounds, action and pulses normal. Short systolic murmur at base. Artery walls slightly palpable. Blood pressure 115/70-110/65. Slight tenderness on deep pressure in gall-bladder region. Shins showed a slightly sabre-like curve anteriorly. Pupils and reflexes normal.



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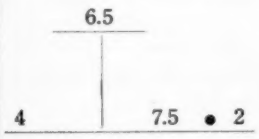

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ficulty. A fair flow of bile obtained. $MgSO_4$ solution caused a good return of well pigmented bile. Plasma dilution less than 10:4. Serum colored dilution. Color disappeared on dilution of 1:90. Widal liver insufficiency test gave no evidence of insufficiency.

In a hot bath the liver edge was distinctly felt, hard and smooth. The gall-bladder was questionably palpable; if palpable it was not much enlarged. The jaundice and itching decreased. October 8 he was discharged.

He returned at intervals for observation. The jaundice steadily decreased and in about two months the urine had become bile free and the stools had remained practically normal in color, but a very slight icterus of the sclerae remained. He gained twelve pounds, reaching 132 pounds two months before his second admission, February 8, four months after his discharge.

Three weeks before readmission he became suddenly jaundiced again. The urine rapidly grew darker and the stools became clay colored. The jaundice deepened progressively, and the pruritus, which had disappeared, returned, though it was not so troublesome as formerly. The patient's appetite became very poor. The sight or smell of food nauseated him. He did not vomit; the night before admission he attempted to do so, but expelled nothing. At this time he noticed a few drops of blood from the nose. His weight had dropped to 124 pounds.

Upon examination he was well nourished. Skin icteric. Slight exophthalmos and a suggestion of nystagmus to the right. Heart showed no enlargement to percussion. Sounds of good quality. A rough systolic murmur at the apex. Pulmonic second sound reduplicated. Artery walls negative. Blood pressure 100/70. Liver dullness from fourth rib to costal margin; edge just felt on deep inspiration. A few scars on shins.

Temperature 99.2° to 96.4°, pulse 112 to 70, respiration 26 to 20. Urine showed bile and leucocytes at both of two examinations. Hemoglobin 50 to 70 per cent., leucocytes 7,600 to 13,600, polynuclears 75 per cent., eosinophils 1 per cent., reds 3,936,000 to 3,656,000, with moderate anisocytosis, platelets normal. Serum dilution 1:324. Wassermann negative. Clotting time 17½-22½ minutes, with calcium chlorid 22½. Stools clay colored at one of two examinations. Guaiac slightly positive at one. X-ray showed the stomach empty in normal time. Peristalsis was active, suggesting irritation. No evidence of any lesion could be made out in the stomach. First portion of duodenum filled poorly, although its irregularity was not typical of a duodenal lesion. No tenderness. Remainder of the tract not remarkable. The same appearances could be due to pathology in the gall-bladder region with reflex and gastric irritability. Dr. W. H. Smith noted, "In the presence of left lower lobe enlargement one cannot be sure of spleen enlargement. I believe there is a small amount of fluid present in the peritoneal cavity. There is no circulatory evidence to favor congestion. No direct evidence of syphilis."

By February 13 the patient felt perfectly well. February 14 he was discharged.

After his discharge the jaundice decreased until the eyeballs were the only icteroid part. He gained 16 pounds during the next two months, but lost about 20 pounds in the following two months, he thought because of restricted diet. During the few months preceding his third admission, June 30, four months after his last discharge, he had very severe night sweats, and toward the end coughed occasionally. A week before readmission he had an attack of shivering followed by fever, which persisted. He had right sided headache. He had not worked since his discharge. The bile in the urine persisted throughout.

Upon examination he was emaciated. Skin, sclerae and mucous membranes deeply jaundiced. Spine prominent but flexible. Soft systolic murmur over the apex. Liver edge palpable 6 cm. below costal margin in midclavicular line, 12 cm. below the sternum. Dullness over this area. Spleen palpable 4 cm. below the costal margin.

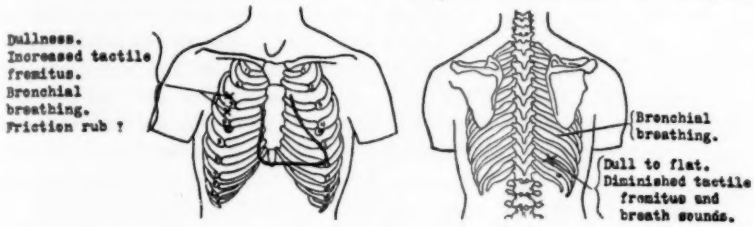
Before operation temperature 97.7° to 102.9°, pulse 60 to 108, respiration normal. Urine dark orange at one of four examinations, bile stained at another, sp. gr. 1.012 to 1.020, bile at all examinations, in large quantities at two, albumin at two, leucocytes at three. Hemoglobin 50 to 75 per cent., leucocytes 7,600 to 20,200, polynuclears 92 to 73 per cent., reds 2,280,000 to 2,300,000, with definite achromia, moderate anisocytosis and some poikilocytosis at one of two examinations. Platelets increased. Myelocytes 12, July 11. Eosinophils 7, July 19. Serum dilution 1:64. Wassermann negative. Bleeding time 2½ minutes. Clotting time 9-12½ minutes, with calcium chlorid 10½ minutes. Duodenal analysis July 6 gave a free flow of bile. Sediment contained much bile stained mucopurulent material with bile pigment, ". . . . Prognosis poor."

The liver became questionably nodular and the enlargement of the left lobe more striking. July 3 there were râles at both bases. The temperature was down. Four days later the patient was symptomatically better, but the fever continued about the same.

July 21 operation was done. He made a fairly good recovery from anesthesia. A week later there was much purulent discharge and he was running a septic temperature and feeling ill. The right lower chest was flat to percussion. About 1000 c.c. of clear straw colored fluid was aspirated. The temperature

was lower after this. The wound broke down and opened wide, with a large amount of drainage. It was strapped. The patient was symptomatically better, and by August 10 was sitting up.

August 14 X-ray showed the lower half of the right chest less radiant than the left. The dullness was most marked toward the base and in the angle between the heart and the diaphside was very indistinct. The costophrenic angle was obliterated. The heart and mediastinal contents were not displaced. The dullness was mottled and had a rather indefinite border except for a sharply defined line running across the chest on a level with the angle of the scapula, suggesting a fluid level.



August 20 the wound was closing together and granulating. August 30 a large tube was inserted into the sinus about three inches to keep it open. The drainage was now thin and mucoid. September 6 X-ray showed much the same appearances. The area at the right base was slightly less extensive. September 7 he was still running a septic temperature, draining about the same, and gaining strength all the time. The jaundice was entirely gone. September 14 thoracentesis failed to produce fluid. The wound was irrigated t.i.d. with Dakin's solution. There was very little change in the next two weeks.

October 5 the sinus was injected with bismuth paste. By X-ray the sinus appeared to stop just beyond the end of the tube, ran to the right and seemed to end near the end of one of the ribs. It seemed fairly superficial.

October 8 the chest was clear except for slight dullness at the right base, but the tactile fremitus was not much diminished. There was still fever and discharge, though the patient was up and about. There was considerable tenderness over the pancreas. The sinus did not seem to run toward the pancreas. The stools now contained some bile, no excess of fats. The blood picture and the urine were not remarkable. Duodenal tube studies showed practically normal duodenal contents. October 18 the patient was discharged, to return in a week for operation.

After his discharge he felt fairly well. At his fourth admission, October 23, he was having very severe sweats every night, and pain ragm. The outline of the diaphragm on this over the incision. He had frequent palpitation, poor appetite, and was somewhat dyspneic on exertion. He had occasional diarrhea and frequent epigastric discomfort, gas and belching not related to meals. His stools were dark, not tarry. He urinated two or three times at night. He was nervous.

On examination the chart was normal. Lung signs as shown in the diagram. Veins over abdomen rather markedly distended. One inch above umbilicus in right upper quadrant was a large draining sinus with a rubber drainage tube from which thick pus exuded. Abdomen slightly full, upper portion tympanitic, the lower dull, with slight tenderness in that portion and near wound. Questionable shifting dullness on percussion. No attempt was made to feel the liver because of the wound. Spleen not felt. Running down the abdomen in the midline subcutaneously was a somewhat hard tubular cord.

Before operation temperature was 98° to 102°, pulse 79 to 120, respiration 20 to 26. Amount and specific gravity of urine not recorded. Urine alkaline at the single examination; no albumin or sugar. Blood not recorded.

X-rays October 4 showed a dense irregular shadow running obliquely across the gall-bladder region in the upward direction, probably opaque material in the injected sinus, but in this view the anteroposterior limits of the shadow could not be determined. October 25 fluoroscopic examination showed the right apex and the entire right lung field less radiant than the left. The left diaphragm was regular. It moved poorly. The costophrenic angle on this side was clear. On the right the diaphragm and costophrenic angle were obscured. The mediastinum was hazy. The plate showed no evidence of pulmonary pathology except for a small area of diminished radiance near the right costophrenic angle. The right diaphragm was high and irregular in outline, but clearly seen. The costophrenic angle was obtuse. The appearance was suggestive of fixation or limitation of the diaphragm on this side, probably from pleural involvement of the right base, due possibly to subdiaphragmatic pathology.

November 2 operation was done. There was extremely severe bleeding. The wound was packed and closed. Next day 400 c.c. of blood was transfused. November 5 the patient was in excellent condition, with no fever. November 7 the gauze was removed with gas. There was a large amount of old blood and

about a pint of clear fluid containing flecks of solid material from the lower wound. November 11 there was a duodenal fistula from the wound. Fluid came through from the stomach almost unchanged. The edges of the wound and the surrounding skin were much reddened and irritated. Food by mouth was stopped. November 12 there was bleeding from the sinus, and about 18 ounces of blood was lost before the wound was packed tight. After the hemorrhage the pulse was about 140; otherwise the condition was satisfactory. The patient was obviously starving on subpectorals and rectal glucose.

November 14 a second operation was attempted, but had to be abandoned because of violent abnormal bleeding. He was placed on constant suction to keep the sinus dry. Practically everything taken by mouth came out in the bottle with the suction. He lost strength. November 21 the duodenal tube was passed in the hope that it might slip by the fistula into the duodenum. After twenty-four hours it was apparently still in the stomach. The aspirated material was acid, while the material from the fistula was alkaline. Fluids placed in the tube came out through the fistula, but after a delay of twenty to twenty-five minutes. The tube irritated and made the patient vomit. It was removed. Two days later he was taking fluids rather well and looked a little better. November 25 a soft rubber catheter was passed gently through the sinus in an attempt to reach the duodenum. It passed in about eight inches easily, but was followed by hemorrhage from the catheter. The bleeding was stopped, but two hours later the patient became pale, irrational, and restless, with a rapidly mounting pulse. 550 c.c. of blood was transfused within an hour of the onset of the symptoms. He was rational and much better after the transfusion, with a pulse of good quality. There was no further bleeding. During the next two days his general condition was quite good, although he seemed to be starving. Early in the morning November 30 there was profuse bleeding from the sinus. It stopped spontaneously and did not greatly affect his condition. The next day he became irrational and was very restless most of the time. That evening while turning in bed he suddenly collapsed, bled profusely from the sinus, and in less than an hour died.

Discussion

BY DR. EDWARD L. YOUNG, JR.

This sounds like what we used to call catarrhal jaundice, except that it has lasted two months instead of a relatively short time. The old arbitrary ruling was that anything over six weeks was not catarrhal jaundice; but Dr. Jones has upset that.

We are told nothing except the jaundice and the symptoms that can go with it. There is no mention made of pain or anything suggesting an acute cholecystitis or a cholelithiasis. The loss of weight of course is that which would go with the upset of his intake. So that if we had this story given two or three weeks after the onset we should think first of that condition called catarrhal jaundice and nothing else. At this stage of the game we wonder if there is something more serious going on. It does not seem very serious because he has worked up to the day before he came in here.

All the urinary findings are consistent with the irritation of bile in the urine.

The only thing in the examination of the stools is the positive guaiac at all of three examinations. That of course should not be present in any trouble in the biliary tract alone.

I do not know what diagnosis they discharged him with, but I do not see that we have the evidence to make a definite diagnosis unless Dr. Jones will say that the technical end of the intubation and that study gives us something.

He got back almost all the weight he had lost during the illness.

They were trying to put syphilis in here somewhere, from the note on the sabre-like curve of the shins and the house officer's notes.

The leucocytes are lower and the eosinophils higher than they were at the first entry. The serum dilution is more than it was before.

This is a longer clotting time than normal.

The record does not say that the spleen edge showed anything abnormal in the way of nodularity or anything of that sort.

The clotting time seems to me surprisingly low with all the jaundice he has had.

It seems to me from my point of view that this is a story of progressive trouble in the biliary tract which has extended over a period of ten months, with jaundice most of the time. It lessened except for a slight icteric tint in the sclerae, but otherwise there has been jaundice. The amount of bile going into the intestine has apparently varied, and this has been painless throughout. There does not seem to be any evidence of portal stasis in spite of the single note of a possible slight amount of fluid in the peritoneal cavity. No mention is made of dilated veins in the abdominal wall.

At his age, forty, when he comes in the last time, it seems as if the best diagnosis was a progressive malignant disease, and that operation if done at all would be to sidetrack the bile so that it could go through the gall-bladder to the intestine.

Other surgical conditions in the biliary tract, such as prolonged hepatitis, are possible but are rarely seen.

Before we make a diagnosis will you discuss it, Dr. Jones, from your point of view?

Dr. Chester M. Jones: I think the interest-

ing part of this case is that it presents one of the none too uncommon problems in a hospital as large as this: long-continued jaundice without pain in relatively old people. We have seen in the last few years a group of cases in which the jaundice has persisted for three, four, or five months, and after that time the jaundice has completely disappeared and the cases apparently have fallen into the group of definite infectious jaundice, that is, infection of the liver commonly known as catarrhal jaundice, possibly due to various organisms. I think the term catarrhal jaundice is not good. The diagnosis almost always rests between malignancy of the head of the pancreas, stone in the common duct, or infectious jaundice.

The blood findings here were also consistent with infectious jaundice, a low blood count, a slight anemia, and at one time a leucopenia, which we do get in the first days with an increase in the lymphoid and mononuclear cells. It is quite characteristic to have the platelets definitely increased.

In infectious cases where the jaundice has lasted two or three months I have seen them lose fifty pounds in weight. The symptoms of distaste for food quite characteristically go with infectious jaundice.

The thing that surprises me in the initial picture is that the spleen was not felt. In most cases of the infectious type that have lasted for some time the spleen is easily felt.

The liver is practically always tender, and the tenderness noted in the first examination in the region of the gall-bladder is a characteristic thing.

The fact that the disease has progressed with never any complete letting up of the jaundice is the uncommon thing in infectious jaundice, and the story of having gone along here about ten months is the unusual part of the picture. Pancreatic malignancy at times does have almost complete disappearance of the jaundice, but that is the unusual thing. I think Dr. Means has seen one case of cancer of the pancreas where it did disappear and reappear.

DR. MEANS: I recall a young man whom we thought had the typical picture of stone. He came to operation and cancer of the head of the pancreas was found. In him the jaundice had cleared up completely.

DR. JONES: The fact that the patient under discussion showed, in spite of the continued jaundice, a free flow of bile which was very dark colored shows that the process was not an obstructive one. It falls into the group of functional jaundice cases, and a large part of the picture in catarrhal jaundice is a functional rather than an obstructive thing.

The Widal liver function test was done and was negative. As a matter of fact it is apt to be negative with a large portion of cases with definite liver pathology. It is of very little use.

The coagulation time, if the observation is correct, is uncommon in cases of infectious jaundice, although it does occur. I think it is extremely interesting and important to note that, because while our usual picture of prolonged coagulation time is that of complete obstruction with jaundice lasting three weeks or more, it can occur in cases where obstruction is not present. The real cause is probably marked disturbance of liver function, and it may be that even without complete obstruction in this case the disturbance was so great as to produce an abnormal clotting time.

A PHYSICIAN: Was that a calcium deficiency or was it more complicated?

DR. JONES: It is more complicated than that. It is perhaps a combination of disturbance in the calcium and fibrinogen balance or that plus some other unknown factor which we do not understand at the present time.

I should say that up to this time, judging from a few other cases I have seen which have run the same course, there was a perfectly good opportunity for this case to be considered a generalized infection of the biliary tract. The marked loss of weight does not disturb me because we see it so often, and the positive guaiac, while it tends more to malignancy, does occasionally occur in these cases.

DR. FREMONT-SMITH: How often does catarrhal jaundice once cleared up reappear?

DR. JONES: It is quite common. What happens in a certain group of the cases is that the original infection is supposed to be taken care of, the patient is allowed to go about and the infection lights up again for a variable length of time. It is very common where patients have been sent home to rest after almost entirely clearing up that they come back with the story of the jaundice clearing up very definitely and then coming back. When the cases instead of lasting five to six weeks last three to four months the story is usually one of ups and downs, and if we saw a chart of the icteric index of this man's case we should find great swings.

DR. MEANS: What is your idea of biliary cirrhosis?

DR. JONES: I do not know the pathological report of this case, but I believe this may end in an infectious cirrhosis, with the progressive enlargement of the spleen and of the liver, and with less tenderness than he showed at first. I should think he would show a definite inflammatory reaction throughout the liver due to a biliary tract infection.

DR. MEANS: Is it fair to draw an analogy with the kidney, and say that as acute nephritis sometimes clears up, but sometimes leads to chronic, so too infectious jaundice sometimes clears up, but in some cases leads to a permanent lesion which is called biliary cirrhosis? Also, is biliary cirrhosis the same as Hanot's disease?

DR. JONES: I believe it is much the same condition. The liver has a greater power for repair than the kidney. My impression is that Hanot's cirrhosis is still not a very clean-cut clinical entity. I think only three or four were described of patients with cirrhosis of the liver. I think one was caused by tuberculosis according to his story, and the other two or three were another process. I may be mistaken.

DR. MEANS: Is biliary cirrhosis a proper term to apply to the case?

DR. JONES: I should think it was. It is hypertrophic in type.

A PHYSICIAN: How is the intensity of the jaundice measured?

DR. JONES: In terms of dilutions. The normal serum dilution as we were doing it was one to twelve or fifteen. That would correspond to an icteric index of five.

A PHYSICIAN: What do you mean by one to twelve being normal?

DR. JONES: Serum dilution is merely taking the serum or plasma and diluting it down with normal saline until the yellow color has disappeared, and it takes about twelve dilutions to do that normally.

A PHYSICIAN: I notice there is no mention of whether there is any sugar in the urine in this case.

MISS PAINTER: There was no sugar.

DR. YOUNG: Then the basis on which you advised operation was, if it was infectious jaundice to give drainage, or if it was malignant to establish the facts.

DR. JONES: In these cases I feel that it is always worth while to explore, because we know that a certain proportion of them are not malignant and not stone.

DR. YOUNG: Have you any idea how often drainage helps these cases?

DR. JONES: No, I have not. I do not think we have done enough. I should like to operate much earlier.

A PHYSICIAN: The gall-bladder does not act as a source?

DR. JONES: Not that I know. It is very difficult to say the nature of the infection or the source of it. It seems to me it is much more logical to call all these cases infectious jaundice. We would do better to give up the idea of calling a case Weil's disease, because Weil's disease is simply an infection of the liver due to a specific organism, and here it is due probably to another organism. They are all biliary infections.

DR. YOUNG'S PRE-OPERATIVE DIAGNOSIS

Infectious jaundice??
Malignancy???

PRE-OPERATIVE DIAGNOSIS, JULY 21

Infectious jaundice.

FIRST OPERATION

Gas and ether. Right upper rectus incision. The liver felt and looked normal. The gall-bladder was distended and contained purulent fluid. There was an abscess in the region of the hepatic duct and the liver. The gall-bladder was drained. The pancreas was swollen and soft but showed no fat necrosis.

FURTHER DISCUSSION

DR. YOUNG: So that this is infectious jaundice.

DR. JONES: It looks like it to me. It is an infection of the entire biliary tract.

DR. YOUNG: Of course the only thing to do is to drain that inside and out. With infection outside and with the stirring up of infection by operation it is logical to believe that there may have been a spreading of that infection. We begin to wonder if there is subdiaphragmatic abscess. The jaundice entirely gone suggests that the drainage has been of benefit. The question was the draining of some focus that was giving him the temperature.

DR. YOUNG'S PRE-OPERATIVE DIAGNOSIS

Subdiaphragmatic abscess.

PRE-OPERATIVE DIAGNOSIS, NOVEMBER 2

Abdominal sinus.

SECOND OPERATION

Gas-ether. An incision encircling the mouth of the sinus was carried through the peritoneum. A mass of adhesions was found, and bled with great profuseness. The opening of the sinus was excised and the path explored with the finger down to the right kidney region. It was evidently an old cavity and did not lead as far as I could make out to any gall-bladder. The hemorrhage was so profuse from the incision that no extended exploration could be made. A counter opening was made in the right flank and a tube sutured to the bottom of the cavity. The rest of the incision was closed with one gauze wick to control the bleeding. No gall-stones or evidence of gall-bladder except the presence of bile were found.

PATHOLOGICAL REPORT

An area of skin from the region of the gall-bladder containing a sinus. A microscopic section through the skin shows its edges infiltrated with focal collections of epithelioid and giant cells with areas of necrosis.

FURTHER DISCUSSION

DR. YOUNG: Would that fluid in the peritoneal cavity agree with your suggestion that it is going on to cirrhosis in the liver?

DR. JONES: I think so. I think we have seen one or two cases which have shown evidence of portal involvement.

DR. YOUNG: It is a picture surgically of trying to find a focus of infection that is keeping him in poor shape. I do not see that we have any evidence to go on except the pus coming out of the sinus, and following that will give us the answer.

A PHYSICIAN: Did the jaundice clear up?

DR. JONES: Following drainage it did clear up.

DR. YOUNG: The duodenal study showed that it was essentially normal bile. Is there anything in that study that should have made that bleeding due to abnormality in the blood?

DR. JONES: I think not at that time.

DR. YOUNG: That simply was the previous bleeding that can come from a very vascular area of adhesions and granulation tissue.

The duodenal fistula must have been a cheerful find for the surgeon. I think all that can be said is that the infection there meant that the wall of the duodenum was friable and was damaged. It was nine days after the tube was put in, and it is possible that there was a pressure necrosis. Of course the digestion goes on, and with a lot of abnormal blood vessels it is no wonder that there was bleeding at this time.

On November 14 they apparently attempted to find the hole in the duodenum and close it.

DR. YOUNG'S PRE-OPERATIVE DIAGNOSIS

Duodenal fistula.

PRE-OPERATIVE DIAGNOSIS, NOVEMBER 16

Duodenal fistula.

THIRD OPERATION

Local novocain. Exploratory incision through the abdominal wall under local anesthesia. The peritoneum was opened through the left rectus and the omentum found everywhere adherent below. There was a tremendous amount of oozing from all the denuded surfaces. On account of the hemorrhage operation was not continued and the free abdominal cavity was not explored. The incision was closed.

FURTHER DISCUSSION

DR. YOUNG: Was anything gained by that? I do not see that there is anything more after the second operation. That is to say that he got a duodenal fistula with the attendant symptoms plus the bleeding which was the final thing that made him die. I shall be interested in learning whether Dr. Richardson finds another focus of sepsis.

CLINICAL DIAGNOSIS (FROM HOSPITAL RECORD)

Tuberculous peritonitis.
Chronic cholecystitis.
Subhepatic abscess.
Duodenal fistula.
Secondary hemorrhage.
Cholecystostomy.
Attempt to close sinus.
Attempted jejunostomy.
Transfusion.

DR. EDWARD L. YOUNG'S DIAGNOSIS

Infectious hepatitis.
Subhepatic abscess.
Duodenal fistula.

ANATOMICAL DIAGNOSIS

1. *Primary fatal lesion*

Tuberculous peritonitis.
Tuberculosis of the retroperitoneal lymph glands.

2. *Secondary or terminal lesions*

Duodenal fistula.
Hemorrhage into the gastro-intestinal tract and the old abscess cavity.
Fatty metamorphosis of the liver.

3. *Historical landmarks*

Chronic pericholecystitis.
Evacuated cavity of old subhepatic abscess.
Hypertrophy of the spleen.
Scars of operation wounds.
Slightly defective closure of the foramen ovale.

DR. RICHARDSON: The anatomical conditions in this case were those of frank tuberculous peritonitis, tuberculosis of the retroperitoneal lymph glands, and duodenal fistula with quite an extensive hemorrhage into the gastro-intestinal tract.

With regard to the liver, there was some increase in the interstitial tissue along the portal canals. The bile-ducts at the time of necropsy were in good condition. There was some fatty metamorphosis of the liver, but other than for the increase of interstitial tissue along the portal canals it was negative.

The spleen was large, weighing 495 grams. There were a few adhesions due to tuberculosis, and some increase in interstitial tissue,—a picture not unlike the liver.

Of course there were the scars of the various operation wounds and the evidence of an evacuated subhepatic abscess cavity, and of no definite peritonitis surrounding this cavity but a lot of disintegrated necrotic material in that region and the region of the end of the sinus and the opening in the duodenum. There were no ulcers in the duodenum, and the only tuberculosis found was in the peritoneum and the glands. The lungs were negative.

The heart was small for him, 220 grams, the valves and cavities frankly negative. The aorta and great branches showed a slight amount of fibrous sclerosis.

In the situation of the gall-bladder there were massive adhesions and what seemed to be a piece of the gall-bladder wall, but no stones were found. The cystic duct was tied off. The bile-ducts within the liver were perhaps a little large. The common duct was twelve millimeters. That is full sized. There were no stones anywhere.

The kidneys weighed 275 grams and were frankly negative.

There was some hemorrhage into the region of the evacuated cavity at the end of the sinus.

DR. FREMONT-SMITH: Did the liver tissue show anything at all?

DR. RICHARDSON: Nothing except the increase of interstitial tissue along the portal canals.

DR. JONES: I think the final picture in the liver is interesting; if it could have been examined five months before it might have shown something very different.

DR. YOUNG: You said the gall-bladder was taken out and the cystic duct tied off.

DR. JONES: I thought they drained it, but I do not think they drained it long. I believe the tuberculosis was coincidental, with nothing to do with infection.

A PHYSICIAN: Do you think infectious jaundice is a good name?

DR. JONES: I think it is better than "catarrhal," which usually means a plug in the common bile-duct, a very rare thing as a matter of fact. It is an infectious jaundice. In our present state of ignorance as to the cause of the various types of infection in the liver that is all we can call it. If we could say that the "catarrhal group" is due to one organism, all right. But as a matter of fact there are two types of catarrhal jaundice, one that starts with upper respiratory and the other with intestinal symptoms, whether two different organisms or two different manifestations I do not know. But practically all these cases are infection of the liver.

A PHYSICIAN: My idea was that it might be better to indicate the picture with the liver condition rather than with the symptom, as jaundice.

DR. JONES: That is perfectly reasonable of course; that is the presenting symptom.

A PHYSICIAN: You are making an entity out of a symptom rather than a pathological condition.

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THE HEALTH COMMISSIONERSHIP OF BOSTON

FOLLOWING this will be found two letters, signed by the Chairman of the Executive Committee of the Boston Health League, which we believe point the way to the removal of the Health Department from the sphere of partisan politics. There is reason to believe that for a great many years personal influence for selfish ends has handicapped the work of our Health Department. In general, too, the appointment of a Health Commissioner in Boston seems to have been looked upon purely from the standpoint of partisan politics.

Former Mayor Peters broke through this precedent when he appointed as Commissioner a man who was especially qualified by training for the position. This appointee set himself against some of the laxities of record-keeping which had prevailed in the department and brought about many improvements, but some of his policies were not endorsed and he was unable to secure cordial coöperation. Consequently his removal by our present Mayor, shortly after assuming the duties of the office created no surprise.

Mr. Curley appointed in his place Dr. Francis X. Mahoney who had been Health Commissioner in the previous administration of his Honor the Mayor. Dr. Mahoney, during the past four years, has been encouraged by the Mayor to develop a health program in which Boston could take pride and such a program has been realized to a surprising degree. In the survey recently made by the Committee on Municipal Health Practice of the American Public Health Association, we understand that Boston heads the list of larger American cities by a considerable margin with a tentative rating of 898 points out of a possible 1,000. It was thought that the final rating would be even higher.

Although Dr. Mahoney would be the last to claim all the credit for the rapid improvements in his department and for the progressive policies which he is developing there, it should be recognized that he has had the wisdom to seek and the tact to obtain the effective coöperation not only of the medical profession in general but also of the Boston Health League and its thirty-two component agencies.

We believe in the wisdom of the health unit and child welfare programs which are being developed, we are impressed by the close coöperation of public and private agencies revealed in the organization of health units, and we are gratified by the favorable attention which they have attracted, not only from many other American cities, but also from most of the civilized nations of the world.

Our conclusion is that Dr. Mahoney has made good, that he should be reappointed, and that the precedent should thus be established that tenure of office in the Health Department of Boston depends on character of service rendered to the public. Every physician who practices in Boston, whether he resides there or not, has a legitimate interest in this matter. We recommend that physicians write to the Hon. Malcolm E. Nichols, 18 Tremont Street, Boston, or to the Chairman of the Executive Committee of the Boston Health League in favor of reappointing Dr. Mahoney at this time.

BOSTON HEALTH LEAGUE, INC.

Executive Secretary, Charles F. Wilinsky, M.D.

President, Francis X. Mahoney, M.D.
Vice-President, Rev. George P. O'Conor.
Treasurer, Richard G. Wadsworth, M.D.
Secretary, Merrill E. Champion, M.D.

Hon. Malcolm E. Nichols,
Mayor-Elect of Boston.
18 Tremont Street, Boston.

Sir:

As Chairman of the Executive Committee of the Boston Health League, I have the honor respectfully to request that at your convenience as to time and place, an opportunity be afforded for an informal conference between you and a small Committee of representative citizens keenly interested in the Boston Health Department. It is expected that the Committee will include members of such organizations as the Community Health Association, the Bos-

ton Council of Social Agencies and the Chamber of Commerce, as well as leaders of the Medical Profession.

This conference is requested in the belief that you desire to give Boston a good administration and with the desire on our part to be helpful if possible.

Very truly yours,

(Sgd) GEORGE C. SHATTUCK, M.D.,
Chairman Executive Committee,
Boston Health League, Inc.

November 7, 1925.

Dear Dr. ———:

On behalf of the Executive Committee of the Boston Health League, I have asked for an informal conference with Mayor-elect Nichols. The purpose of the conference is:

(1) To ask that most careful consideration be given to the problem of lifting the City Health Department to a plane entirely above partisan politics;

(2) To emphasize the importance, and to ask his support, of certain policies which are now being worked out in Boston, namely:

(a) Of fostering coöperation between public and private agencies in combined health programs for the city; and

(b) Of developing the Health Center and Child Welfare programs of the Health Department.

I have already sent you papers by Dr. Wilinsky which describe the new work of the Health Department in the fields above mentioned. Will you look these over and if you believe we are on the right track send me a letter addressed to Hon. Malcolm E. Nichols which can be presented at the conference?

Very truly yours,

(Sgd) G. C. SHATTUCK, M.D.,
For the Executive Committee,
Boston Health League, Inc.

WHAT IS THE BOSTON HEALTH LEAGUE?

THE Boston Health League was incorporated in Massachusetts in 1922. Its membership consists not of individuals but of some thirty independent organizations which are more or less actively interested in health matters in Boston. Although most of these organizations are of a private character, the Boston Health Department, the Boston Department of Medical Inspection of the Public Schools, the Boston Sanatorium and the Department of Public Health of the State of Massachusetts are included in the membership.

The original purpose of the League was to promote coöperation between agencies, whether public or private, in the field of health, to enhance efficiency and to promote economy. After a period of study of the problems involved in a limited area, a combined health program for the entire city was visualized. It was recognized as a cardinal principle that the officially constituted health agencies of Boston should lead in all matters coming within their jurisdiction, and that the private organizations should aid in the development of the program. It was further recognized that the public agency is less free than the private agency in the development of new activities, the value of which is uncertain. Consequently, the private agency should supplement the work of the public agency and harmony should prevail between them.

Early this autumn, the Executive Committee of the League believing that the Boston Health Department should be protected in every possible way from selfish political pressure, determined to bring to the attention of medical societies and lay organizations the outstanding progressive programs of the Health Department. A beginning has been made in pursuance of this policy by asking several of the medical societies of Boston to arrange for the presentation of health programs to their membership during the coming winter, by plans to present the essential facts to the members of the Home and School Association, and by bringing important health policies to the attention of the Health Committee of the Boston Chamber of Commerce. We are informed that this Committee has taken an active interest, that the Boston Chamber of Commerce is beginning to realize that the health of the citizens of Boston is a matter of more than academic interest, and we hope for the future that the Chamber, guided by its Health Committee, will play an important part in helping to raise the standard of efficiency in the administration of official health work in Boston. Although great progress has been made, much more needs to be done. The best results can only be obtained by active manifestation of interest in health problems by citizens of Boston Medical societies and lay organizations interested in health should actively support the work of the Health League or should work in close coöperation with it for similar ends.

TO BANISH PARESIS FROM THE EARTH

DR. H. C. SOLOMON in an article published in the *Monthly Bulletin of the Massachusetts Society for Mental Hygiene,* contends that paresis may be dealt with as successfully as has been the case with typhoid fever or smallpox. He cites statistics which show that 10% of the first admissions to hospitals for the insane are cases of paresis and of the 6909 men who died between the ages of 40 to 60 in New York in 1913, one in nine died of paresis. Durin the same period, of the 5299 women, one in thirty were victims of the disease. Since syphilis is the cause of paresis, the problem is to prevent or at least cure syphilis.

The attention given to syphilis during the recent war seems to have subsided to a considerable degree and although public health organizations continue activities relating to venereal diseases, the average person is less aware of the importance of prevention and cure of the disease than seemed to be evident during the war.

The diagnosis of syphilis is comparatively easy; intensive and persistent treatment is es-

sential. Most cases can be cured. The incompletely treated cases are quite sure to show a proportion of neurosyphilitics. The treatment of syphilis today is a highly technical procedure. The great function of the family physician in dealing with syphilis is to impress on patients the importance of the prevention of the disease and the absolute necessity of careful and persistent treatment if it has been acquired, and unless he has had thorough training in the work the case must be referred to those who are competent to treat it.

Prevention and cure of syphilis would practically banish paresis.

AN INGENIOUS THEORY

Our attention has been called to an article published in the Boston Medical and Surgical Journal under the title of "Influence of Malarious Atmosphere in the Prevention and Cure of Phthisis Pulmonalis" written by Horace Green, M.D., of New York, Professor of the Theory and Practice of Medicine in the Vermont Academy of Medicine, under date of February 12, 1840.

The writer of the communication calling attention to this article feels that the views presented by Dr. Green have historical significance, especially in connection with the belief held by some today that the development of malaria in a paretic patient has therapeutic value. A record of five cases diagnosed as consumption, who contracted malaria and recovered, is given in Green's article. The opinion of others is submitted that after several areas of swampy ground supposed to be connected with the existence of malaria were drained, thereby eliminating the malaria, that the people in those places suffered more generally with phthisis pulmonalis.

We are very glad to accede to the wishes of our correspondent in making references to these reports. We are, however, not convinced from a reading of the paper that the facts were accurately recorded or the conclusions are of scientific importance.

THIS WEEK'S ISSUE

Contains articles by:

Garland, Joseph, A.B.; M.D., Harvard Medical School, 1919; Visiting Physician to the Children's Medical Department, Massachusetts General Hospital; Assistant in Pediatrics, Harvard Medical School; Secretary, New England Pediatric Society. His subject is "Handbook for Health Examinations by Physicians."

Truesdale, Philemon E., F.A.C.S.; M.D., Harvard Medical School, 1898; Member, New England Surgical Society, The American Surgical Association and American Association for Thoracic Surgery. He writes under the title: "Obstruction of the Common Duct Among 1000 Operations Upon the Gall Bladder and Bile Ducts."

The Massachusetts Medical Society

NEW ADDRESSES

To Fellows of the Society:

Please send at once to the Secretary any changed addresses for the *Annual Directory*, soon to be issued.

W. L. Burrage, *Secretary.*

182 Walnut St.,
Brookline, Mass.

MEMBERSHIP CHANGES

Dr. Thomas E. Buckman has moved from Boston (Suffolk) to Jacksonville, Florida (Non-Resident List), 513 Laura Street.

Dr. Harold H. Gile has moved from Brookline (Norfolk) to New York City (Non-Resident List). His address is 439 East Fifty-first Street.

1906 } Reynolds, John Timothy, was restored to the
1925 } privileges of fellowship by vote of the Council, October 7, 1925.

MISCELLANY

CREDIT TO NEW HAMPSHIRE

Since 1920 New Hampshire has held second place in the per capita of Christmas seals sold in the entire country. New York state has held first place. With her great resources New York should be at the top but New Hampshire is ambitious to exceed the per capita record of the larger state.

New Hampshire has the record of reducing the tuberculous death rate 45% since 1919. This means the saving of over two hundred lives each year. It is claimed that a larger percentage of the possible number of tuberculosis patients are under treatment in this than in any other state of the country in proportion to population.

The New Hampshire State Board of Health has published the following statistics:

1. Ten percent reduction in tuberculosis death rate.
2. 218 patients with disease arrested.
3. 1561 improved patients.
4. 56 clinic centers in operation.
5. 12 new clinic centers opened.
6. 248 clinics held during the year.
7. 42 special clinics for underweight children.
8. 3367 new persons examined in the clinics, including 2166 children.
9. 4162 patients under treatment including children.

10. 20,833 visits by the tuberculosis nurses during the year.

The above summary does not include the figures with reference to the hundreds of old cases under treatment or the thousands of re-examinations. The Tuberculosis Clinic Centers now reach every section of the state. The tuberculosis nurses, assisted by the State Board of Health Nurses and others, have carried out a state-wide survey so that today 4162 of the estimated 6000 tuberculosis victims in the state are now under treatment and care. All of this represents a prodigious amount of work and loyal devoted service to the cause.

PROGRAM FOR COMMUNITY AND HEALTH DAY

Saturday, November 21. "Physical education means health and strength."

1. The school is a community center.
2. Equality of opportunity for every American boy and girl.
3. Public library service for every community.
4. Proper food and rest for children.
5. A health officer for every community.
6. Adequate parks for city, State and Nation.

Slogans:

A square deal for the country boy and girl.
A sound mind in a sound body.
Visit your neighbor today.

The school is an intimate part of the community. It reflects the sentiments and ideals of the community, and, in turn, it shapes those sentiments and ideals. The school health work halts without community interest, and the public-health program is only fully appreciated and supported by those who have been informed during their school course of the nature and needs of the community.

Health is of the first importance and the wise community will furnish its most precious possessions—its children—the most healthful conditions for education which it can afford, and will offer them such health supervision and instruction as will enable them to make the most of the mental training they may receive. The schools, on the other hand, should include in their health program the teaching of the methods and means which must be employed for the protection and promotion of the common health.

ADVERTISING

Good advertising is necessary to complete success. This should begin early and the preparation of posters for display in public places can form a part of school work. The newspapers and the pupils should be glad to be of assistance. The parents of the school children should be cordially invited.

If a pageant or play devoted to health is planned, such material may be obtained from the American Child Health Association, 370 Seventh Avenue, New York City, and from the National Tuberculosis Association at the same address. Suggestions and a bibliography of plays, pageants, etc., are to be found in Dramatics for Health Teaching, Health Education No. 13, which may be obtained from the Superintendent of Documents, Government Printing Office, Washington, D. C., for 5 cents.

LITERATURE

The following publications of the Bureau of Education may be helpful in the observation of the week and may be obtained from the Superintendent of Documents, Government Printing Office, Washington, D. C., at the prices indicated.

HEALTH EDUCATION SERIES

No. 5. Child Health Program for Parent-Teacher Associations and Women's Clubs. Lucy W. Collier. Single copy, 5 cents. Additional copies, 3 cents each.

No. 17. Helps for the Rural School Nurse. Harriet Wedgwood and Hazel Wedgwood. Single copy, 10 cents. Additional copies, 4 cents each.

No. 18. What Every Teacher Should Know About the Physical Condition of Her Pupils. James F. Rogers. Single copy, 5 cents. Additional copies, 2 cents each.

SCHOOL HEALTH SERIES

No. 1. Health for School Children. A report of the Advisory Committee of the National Child Health Council. Single copy, 10 cents. Additional copies, 7 cents each.

No. 2. The Child Health School in the School of Education of the University of Chicago. Lydia J. Roberts. Single copy, 10 cents. Additional copies, 7 cents each.

No. 3. Who's Who in Healthland. A report on methods used to stimulate the acquisition of health habits in the public schools of Newton, Mass. Anne Whitney. Single copy, 10 cents. Additional copies, 5 cents each.

No. 4. Growing Healthy Children. A study of health supervision in the Trenton, N. J., schools. Mrs. Ina J. N. Perkins. Single copy, 5 cents. Additional copies, 3 cents each.

No. 6. Municipal School Playgrounds and their Management. J. F. Rogers. Single copy, 5 cents. Additional copies, 2 cents each.

No. 7. Recognition of Health as an Objective. Report of Conference at Boston, October, 1923. Harriet Wedgwood. Single copy, 5 cents. Additional copies, 3 cents each.

No. 8. School Health Supervision. Report of Conference at Detroit, October, 1923. Harriet Wedgwood. Single copy, 5 cents. Additional copies, 3 cents each.

PHYSICAL EDUCATION SERIES

No. 1. Preparation of School Grounds for Play Fields and Athletic Events. Dorothy

Hutchinson. Single copy, 5 cents. Additional copies, 3 cents each.

No. 2. Athletic Badge Tests for Boys and Girls. Single copy, 5 cents. Additional copies, 3 cents each.

No. 3. Suggestions for a Physical Education Program for Small Secondary Schools. Walter F. Cobb and Dorothy Hutchinson. Single copy, 10 cents. Additional copies, 5 cents each.

No. 4. Athletics for Women. J. F. Rogers. Single copy, 5 cents. Additional copies, 1 cent each.

MISCELLANEOUS PUBLICATIONS

School Grounds and Play. Henry S. Curtis. (Bulletin, 1921, No. 45.) 5 cents.

AUXILIARY HELPS

What is Health? (Health card No. 1.) Single copy free.

Rules of the Health Game. (Health card No. 2.) Single copy free.

Sleep Poster. (Health Education Poster No. 5.) Single copy, 5 cents. Additional copies, 2 cents each.

—*Bureau of Education, Washington.*

PERSONALLY APPLIED PREVENTIVE MEDICINE

MAN himself is cheating science of her victory in the conservation of human life.

Medical science has conquered to a large degree the scourges which decimated men in bygone ages. It has almost conquered the infectious diseases of children, and is saving so many of the human young for maturity and productive citizenship that our forefathers in their day would have thought the effects of science nothing short of miraculous. It has also safeguarded the lives of women in their destiny of perpetuating the race.

Man, however, holds the gifts of science lightly. Having been saved from the perils of childhood, having escaped smallpox, typhus, cholera, typhoid fever and other disease which killed people by the thousands thirty or forty years ago, he needlessly abuses himself and through wrong eating habits, lack of proper outdoor activity and a life that demands too severe a strain upon his nervous system, undermines his health and manages often to die younger than did his grandfather.

Dr. William G. Exton, head of the longevity service, maintained by the Prudential Insurance Company, in discussing the triumphs of science in the field of preventive medicine, deplored this indifference to health on the part of so many people, and emphasized the great benefits to be expected from what he called the newer, or personally applied, preventive medicine.

"Science, working for the good of all, continues to triumph over the waste of human life in the mass," said Dr. Exton. "The individual man or woman, unappreciative of these efforts, forms habits that defeat the life works of countless men who have labored to vanquish disease and conserve human life.

"The fact is that while babies born today have many times more chance of living to maturity than they did twenty-five years ago, the person of thirty-five today needs help to keep as many years ahead of him as had his grandfather when he was 35 years old. The failure is that of the individual—not of medical science or physicians. To-day man has everything but himself working in his favor for health and longevity.

"The public health work of the last twenty years, the fight against tuberculosis—then referred to as the 'great white plague'—and the consequent decrease in the tuberculosis death rate, the introductions of anti-toxins for typhoid, diphtheria and now scarlet fever, has caused a material decrease in the death rate during the last twenty-five years. This decrease has been by far the greatest in the younger ages, particularly during infancy and childhood.

"The improved sanitation everywhere and its beneficent effect upon health is a development which is now taken for granted. The teaching of hygiene in the schools and this propaganda generally has made any deflection from the strictest personal cleanliness a cause of shame and embarrassment. People have also been taught much about food and its relation to the bodily processes and health.

"Yet heart and arterial troubles are making themselves felt more than they did a generation ago. The same fact holds true of diseases of the digestive system and the kidneys. Rheumatism, neuritis, vertigo and other ailments are signs of a disregard of the organs upon which the functions of the body are directly dependent. They withstand the abuses heaped upon them without breaking down until a point is reached when structure is undermined and then it is too late to do much in the way of repair.

"For example, diabetes may go on for years without troublesome symptoms. During this time control by simple treatment is easy if its presence be known. Certain kidney diseases are very insidious in their first stages and progress almost imperceptibly until the disease approaches the terminal stages. Simple measures would often stay their progress if applied in time.

"Similarly, tendencies to apoplexy, arterial troubles and the nervous diseases, if discovered in time, can frequently be averted, or held in check for years. It is for this reason that all enlightened physicians are urging the periodical health review habit in which the Prudential is active in helping them through its longevity service. Our millions of policyholders are being told regularly of the privilege they and their physicians enjoy in being able to call on the longevity service at any time for health help and many have been greatly benefited.

"Every normal, healthy minded person wants to live as long as he can and to enjoy his full span of life without the burdens of chronic disease. But to do so he must think 20 years ahead and when he reaches thirty-five or forty have some competent physician regularly check up on his health condition. He cannot subject his body and mind to the strain of the strenuous life, eat what and when he pleases, and expect to be hale and hearty and to keep going to 70. If the average adult would pause every year long enough to take a health inventory, not so many would drop in their tracks at fifty or thereabouts."

SMALLPOX AND VACCINATION

"California leads in smallpox," *The California and Western Medicine* recently asserted, "And also in anti-vaccination propagnada. The two things go together."

"We led all the states during 1924 with 9,425 cases of smallpox," it is explained, "and fifty-six deaths. Ohio was our closest competitor, with 5,597 cases and fifty-eight deaths."

"Oh well, the anti's must spend some of their money, but why purchase a repulsive disease like smallpox with it? The pathetic feature of this totally useless and unnecessary injury to health and sacrifice of life is, that many of the victims were children."

When efforts were being made last year to direct the attention of the citizens of Ohio toward the dangers of an epidemic of smallpox, the anti-vaccinationists were unusually active. They denied the presence of smallpox. They resorted to test cases in courts. They endeavored to sledge-hammer legislation through the General Assembly designed to destroy the effectiveness of the vaccination and quarantine laws.

As pointed out in *California and Western Medicine*, Ohio ranked second in the number of smallpox cases last year. And possibly ranked second, if not first, in the amount of noise from those opposed to vaccination.—*The Ohio State Medical Journal, Nov. 1, 1924.*

RECENT DEATH

BRYANT—Dr. Giles Waite Bryant, a Fellow of the Massachusetts Medical Society, died suddenly at his home in West Somerville, November 8, 1925, aged 68.

He was born in West Windsor, Vt., August 16, 1857, and was a graduate of Kimball Union Academy, Baltimore, Md., and of Dartmouth Medical School in 1882. He settled in Somerville in 1892 and joined the State medical society, practising there since. He was a member of Caleb Rand Lodge of Odd Fellows and Foley Lodge of Masons, and a member of the board of Trustees of the Somerville Public Library. Dr. Bryant is survived by his widow, who was Miss Estelle Patrick of Westminster.

CORRESPONDENCE

A CORRECTION OF DR. WOODWARD'S FIGURES

October 16, 1925.

Editor, Boston Medical and Surgical Journal:

I have read Dr. Samuel B. Woodward's letter in your issue of October 15, in which he comments on my statement to the press in regard to smallpox and vaccination in Australia. As my facts were all drawn from the United States Public Health Service Reports for August 14, 1925, I could not imagine what was wrong, when I saw Dr. Woodward's long article. I thought that I must inadvertently have misquoted my authority.

Hurrying over the statistics quoted by me showing insignificant smallpox figures during the period 1909-1923, such as Victoria 9, Queensland 5, South Australia 1, West Australia 7, and Tasmania 0, Dr. Woodward seizes upon the figures for New South Wales, 2400 cases, and makes New South Wales his chief text.

He says: "By Mr. Nunn's own figures for New South Wales, 2400 cases since 1909, 1073 of them in one year. Twenty-four hundred cases is, man for man, 24 times as many as Massachusetts accumulated during the same period."

The Doctor must have written this part of his essay hurriedly. There were 854 cases of smallpox reported in Massachusetts for the period 1909-1923 inclusive, and I do not believe the Doctor would expect me to overlook the fact that 2400 is not 24 times 854.

But that is not all that is wrong with the picture. The United States Public Health Service Reports cited, page 1689, says: "Twenty-four hundred cases of smallpox, with four deaths, were reported in New South Wales during the period under study. *In only one of the deaths, however,* is smallpox ascribed as other than a contributory cause." Italics are mine.

Was this the dread disease Doctor Woodward is so concerned about? Twenty-four hundred cases, and only one death from smallpox alone!

But of the 854 cases in Massachusetts from 1909 to 1923 inclusive, 24 died, in spite of the greater attention here given to vaccination.

Where does the advantage lie, with vaccinated Massachusetts or with relatively unvaccinated New South Wales?

Very truly yours,
Henry D. Nunn.

A Rejoinder

Why should not "Dr. Woodward seize" on the figures which show that quarantine alone cannot protect an unvaccinated community against an invasion of smallpox? If Mr. Nunn thinks that 2400 cases, 1073 in one year, is proof that vaccination is unnecessary, further argument with him on that subject is useless.

No! 2400 is but 3 times 854, and "man to man" in these figures, New South Wales shows but 6 times the incidence of smallpox presented by Massachusetts, the population of the State being more than twice that of the Australian Commonwealth. I cry, "Peccavi."

Six times is, however, six times, and 845 cases in 15 years looks rather good to me when compared with 1073 in one.

Does Mr. Nunn really believe that the low death rate he gives for New South Wales is due to the unvaccinated condition of the population? Does he not know of the two distinct types of the disease, smallpox, the mild and the virulent?

If Mr. Nunn will tell me how many of those who died in New South Wales and in Massachusetts had been vaccinated within 7 years or 10 years, or 15 years, or had ever been vaccinated at all, then he and I can discuss death statistics with some profit.

Twenty-two persons died of smallpox in Windsor, Ontario, in 1924. Not one had been successfully vaccinated. Thirty-one died in Toledo. Not one had been successfully vaccinated within 20 years. Three hundred and six died in Minnesota. Not one had been successfully vaccinated within 7 years and 243 were never vaccinated at all.

To talk of fatalities without knowing of the conditions under which they occurred is futile, nor if there were no fatalities would I for one care to see an epidemic of smallpox come into a community in which I had an interest.

SAMUEL B. WOODWARD.

MASSACHUSETTS DEPARTMENT OF PUBLIC HEALTH

CASES OF COMMUNICABLE DISEASE REPORTED FOR THE WEEK ENDING NOVEMBER 7, 1925

Anterior poliomyelitis	5	Scarlet fever	187
Chickenpox	120	Septic sore throat	2
Diphtheria	81	Syphilis	12
Encephalitis lethargica	2	Suppurative conjunctivitis	14
German measles	25	Tetanus	1
Gonorrhea	51	Trachoma	2
Influenza	6	Tuberculosis, pulmonary	84
Measles	575	Tuberculosis, other forms	9
Mumps	24	Tuberculosis, hilum	3
Ophthalmia neonatorum	27	Typhoid fever	8
Pneumonia, lobar	101	Whooping cough	183

MASSACHUSETTS DEPARTMENT OF PUBLIC HEALTH

RESUME OF COMMUNICABLE DISEASES OCTOBER, 1925

GENERAL PREVALENCE

The following common communicable diseases showed an increase over last month: Chickenpox, diphtheria, measles, pneumonia (lobar) and scarlet fever.

	Oct., 1925	Sept., 1925	Oct., 1924
Chickenpox	344	83	352
Diphtheria	388	288	583
Measles	1,300	269	250
Pneumonia, lobar	284	130	299
Scarlet fever	566	225	742

RARE DISEASES

Anterior poliomyelitis was reported from Amesbury, 1; Andover, 1; Boston, 7; Brookline, 2; Cambridge, 1; Dover, 1; Fall River, 2; Haverhill, 1; Ipswich, 1; Lowell, 1; North Adams, 1; Quincy, 3; Richmond, 1; Salem, 1; Springfield, 2; Swansea, 1; Wellesley, 1; Weston, 1; Woburn, 1; Worcester, 1; total, 31.

Dog-bite requiring anti-rabic treatment was reported from Beverly, 1; Billerica, 2; Boston, 1; Lowell, 9; Revere, 2; Watertown, 1; Winthrop, 1; total, 17.

Dysentery was reported from Boston, 4; Weymouth, 1; total, 5.

Encephalitis lethargica was reported from Boston, 3; Cambridge, 4; Everett, 1; Mansfield, 1; Northampton, 2; Peabody, 1; Springfield, 1; Worcester, 1; total, 14.

Epidemic cerebrospinal meningitis was reported from Boston, 2; Cambridge, 1; Lowell, 1; Melrose, 1; total, 5.

Hookworm was reported from Boston, 1.

Malaria was reported from Cambridge, 1; Medford, 1; Northbridge, 1; total, 3.

Pellagra was reported from Arlington, 1; Danvers, 1; Worcester, 1; total, 3.

Septic sore throat was reported from Boston, 6; Fall River, 1; Ipswich, 1; Lowell, 1; total, 9.

Tetanus was reported from Boston, 2; Everett, 1; Haverhill, 1; total, 4.

Trachoma was reported from Boston, 4; Haverhill, 1; total, 5.

DISTRIBUTION

All Communicable Diseases

	Oct., 1925	Oct., 1924
Total cases (all causes)	5,249	4,128
Case rate per 100,000 population	130.0	103.1

Certain Prevalent Diseases

Diphtheria	Oct., 1925	Oct., 1924
Total cases	388	583
Case rate per 100,000 population	9.6	14.6

Cities and towns noticeably exceeding their median endemic index*:

Middleboro	(0)	13	Worcester	(41)	51
Fitchburg	(10)	29			

Measles	Oct., 1925	Oct., 1924
Total cases	1,300	250
Case rate per 100,000 population	32.2	6.2

Cities and towns noticeably exceeding their median endemic index*:

Fall River	(1)	172	Lowell	(3)	241
Mansfield	(0)	31	Waltham	(1)	44
Boston	(84)	149	Watertown	(1)	18
Everett	(0)	19	Gardner	(0)	12
Ipswich	(0)	16	Holden	(0)	8
Lynn	(3)	64	Worcester	(6)	462

Scarlet Fever	Oct., 1925	Oct., 1924
Total cases	566	742
Case rate per 100,000 population	14.0	18.5

Cities and towns noticeably exceeding their median endemic index*:

New Bedford	(8)	24	Revere	(4)	12
Framingham	(2)	19	Wakefield	(1)	6
Marlboro	(0)	7	Lowell	(13)	25
Everett	(6)	23	Somerville	(8)	18
Newburyport	(1)	12	W. Springfield	(0)	16

Tuberculosis, Pulmonary	Oct., 1925	Oct., 1924
Total cases	423	446
Case rate per 100,000 population	10.5	11.1

Tuberculosis, Other Forms	Oct., 1925	Oct., 1924
Total cases	67	74
Case rate per 100,000 population	1.7	1.8

Typhoid Fever	Oct., 1925	Oct., 1924
Total cases	68	63
Case rate per 100,000 population	1.7	1.6

Cities and towns noticeably exceeding their median endemic index*:

Quincy	(0)	9

Whooping Cough	Oct., 1925	Oct., 1924
Total cases	715	231
Case rate per 100,000 population	17.7	5.8

Cities and towns noticeably exceeding their median endemic index*:

Attleboro	(0)	8	Beverly	(0)	10
Dartmouth	(0)	14	Melrose	(0)	14
New Bedford	(2)	19	Swampscott	(0)	14
Boston	(70)	186	Lawrence	(6)	31
Brookline	(4)	25	Medford	(1)	12
Cambridge	(26)	39	Watertown	(0)	11
Newton	(7)	26	Worcester	(14)	79
Walpole	(0)	7			

*The median endemic index is obtained by arranging in arithmetical sequence the monthly totals of reported cases for the past five years and selecting the middle figure. The numbers in parentheses after the name of each city and town indicate the median endemic index for that city or town; the numbers without parentheses indicate the cases reported during the current month.

CONNECTICUT DEPARTMENT OF HEALTH

MORBIDITY REPORT FOR THE WEEK ENDING NOVEMBER 7, 1925

Diphtheria	30	Encephalitis epid.	1
Last week	36	Favus	1
Diphtheria bacilli carriers	4	German measles	2
Typhoid fever	3	Influenza	9
Last week	3	Mumps	1
Scarlet fever	34	Pneumonia, lobar	34
Last week	44	Poliomyelitis	1
Whooping cough	46	Septic sore throat	2
Last week	30	Tuberculosis, pulmonary	17
Measles	61	Tuberculosis, other forms	4
Last week	49	Gonorrhea (includes 13 delayed reports)	78
Bronchopneumonia	20	Syphilis (includes 3 delayed reports)	52
Cerebrospinal meningitis	1		
Chickenpox	57		

NEWS ITEMS

ANOTHER HEALTH UNIT IN BOSTON—The corner stone of the new Health Unit to be built at Paris and Emmons streets, East Boston, has been laid. The cost of erecting this unit will be $250,000. The building will be of brick and of fireproof construction.

THE CRITTENTON HOME—The Florence Crittenton League of Compassion has dedicated a new maternity hospital and home on the site of the old Peter Faneuil homestead, Oak Square, Brighton.

The present indebtedness is $50,000 and $150,000 is especially needed to carry on the work. Various circles of the League are at work raising money.

TUFTS COLLEGE MEDICAL SCHOOL—New faculty appointments, 1925-1926: Dr. Charles F. Painter, Professor of Medical History; Dr. Mark Homer Rogers, Professor of Orthopedics; Dr. Frederic L. Good, Associate Professor of Obstetrics; Dr. Alonzo Kingman Paine, Associate Professor of Obstetrics; Dr. Edward J. Denning, Assistant Professor of Theory and Practice of Medicine; Dr. Frank H. Dunbar, Assistant Professor of Pathology; Dr. Edward K. Ellis, Assistant Professor of Ophthalmology; Dr. John F. Fennessey, Assistant Professor of Theory and Practice of Medicine; Dr. Joseph E. Hallisey, Assistant Professor of Theory and Practice of Medicine; Dr. Joseph M. Lynch, Assistant Professor of Theory and Practice of Medicine; Dr. Edwin Place, Assistant Professor of Pediatrics.

BEQUEST TO HARVARD MEDICAL SCHOOL—By the will of the late Dr. John W. Elliott the Harvard Medical School will receive $5000.

COLUMBIA-PRESBYTERIAN MEDICAL CENTER—*Science* reports on the progress of the fund to the Presbyterian Hospital's share of the cost of the new medical center, as made public by Dean Sage, president of the hospital. Of the necessary sum of $7,000,000, a total of $6,250,000 has been received to date.

NOTICES

UNITED STATES CIVIL SERVICE EXAMINATION

The United States Civil Service Commission announces the following open competitive examination:

Associate Social Economist (Prenatal and Child Nutrition)

Receipt of applications for this position will close December 15. The examination is to fill vacancies in the Children's Bureau, Department of Labor, at an entrance salary of $3000 a year. After the probational period of six months required by the civil service act and rules advancement in pay may be made without change in assignment up to $3600 a year. Promotion to higher grades may be made in accordance with the civil service rules.

The duties of the position are to make studies and prepare popular leaflets and bulletins on the subjects of prenatal nutrition, the nutrition of infants and young children, and child care and training; to advise with the State child hygiene divisions, coöperating under the Maternity and Infancy Act, with reference to these problems, and to work out plans for developing and coördinating the activities in these fields.

Full information and application blanks may be obtained from the United States Civil Service Commission, Washington, D. C., or the secretary of the Board of United States Civil Service Examiners at the postoffice or custom house in any city.

UNITED STATES CIVIL SERVICE EXAMINATION

The United States Civil Service Commission announces the following open competitive examination:

ASSOCIATE PSYCHOLOGIST

Receipt of applications for associate psychologist will close December 8. The examination is to fill a vacancy in the United States Public Health Service, Atlanta, Ga., and vacancies in positions requiring similar qualifications.

The entrance salary is $3,000 a year. After the probational period of six months required by the civil service act and rules, advancement in pay may be made without change in assignment up to $3,600 a year. Promotion to higher grades may be made in accordance with the civil service rules.

Applicants must have been graduated from a college or university of recognized standing with major work in psychology, and have had at least three years of responsible experience in psychological research or teaching psychology in a college or university.

The duties of the position are to conduct special investigations of the mental status of negro school children.

Competitors will not be required to report for examination at any place, but will be rated on their education and experience, and a thesis or publications to be filed with the application.

Full information and application blanks may be obtained from the United States Civil Service Commission, Washington, D. C., or the secretary of the Board of United States Civil Service Examiners at the postoffice or custom house in any city.

UNITED STATES CIVIL SERVICE EXAMINATION

The United States Civil Service Commission announces the following open competitive examination:

Junior Medical Officer
Assistant Medical Officer
Associate Medical Officer
Medical Officer
Senior Medical Officer

Applications for the positions listed above will be rated as received until December 30. The examinations are to fill vacancies in various branches of the Government service.

For positions in the Departmental Service at Washington, D. C., the entrance salaries are as follows: Junior medical officer, $1860 a year; assistant medical officer, $2400 a year; associate medical officer, $3000 a year; medical officer, $3800 a year; and senior medical officer, $5200 a year. Advancement in pay may be made without change in assignment up to $2400 a year for junior medical officer, $3000 a year for assistant medical officer, $3600 a year for associate medical officer, $5000 a year for medical officer, and $6000 a year for senior medical officer.

For positions in the field services appointments may be made at the salaries stated above or at higher or lower salaries, the entrance salary depending upon the qualifications of the appointee as shown in the examination and the duty to which assigned.

Competitors will not be required to report for examination at any place, but will be rated on their education, training and experience.

Full information and application blanks may be obtained from the United States Civil Service Commission, Washington, D. C., or the secretary of the Board of United States Civil Service Examiners at the postoffice or custom house in any city.

NOTICE

THE Massachusetts General Hospital and The Boston City Hospital will notify the BOSTON MEDICAL AND SURGICAL JOURNAL of surgical operations listed each day.

This information will be transmitted to all who may apply by telephone at 9.05 a. m. or later.

REPORTS AND NOTICES OF MEETINGS

BOSTON MEDICAL HISTORY CLUB

CHARCOT CENTENARY MEETING

THE next meeting will be held at the Boston Medical Library, 8 The Fenway, Monday, November 23, 1925, at 8.15 o'clock, in conjunction with the Harvard Medical Society.

Speakers: M. Allen Starr, M.D., of New York City, Morton Prince, M.D.

Physicians and medical students are cordially invited to attend.

HENRY R. VIETS, M.D., *Secretary.*

THE PHYSIOLOGICAL CONFERENCE

THE fourth weekly meeting of the Physiological Conferences will be held in the Bowditch Library of the Harvard Medical School on Monday afternoon, November 23, at 4 o'clock. Dr. A. C. Redfield will speak on "The Respiratory Function of Invertebrate Bloods Containing Hemocyanin."

RUTH TYLER, *Secretary.*

ESSEX SOUTH DISTRICT MEDICAL SOCIETY

1925

Wednesday, December 2, 7 P.M.—New Ocean House, Swampscott, Dr. T. J. O'Brien, Boston, "Medical Legislation." Dr. Channing Frothingham, Boston, "Cults."

1926

Wednesday, January 6, 5 P. M.—Beverly Hospital. Clinic 7 P. M. Dinner. Speaker, Dr. Paul D. White, Boston, "Recent Progress in the Study and Treatment of Heart Disease."

Wednesday, February 3, 7 P. M.—Hawthorne Hotel, Salem. Dr. Walter Timme, New York. Subject to be announced.

Wednesday, March 3, Lynn Hospital. 5 P. M. Clinic 7 P. M. Dinner. Dr. Charles E. Mongan, Somerville, "Some Problems of Present Day Practice."

Thursday, May 6—Censors meet at Salem Hospital, 3.30 P. M.

Tuesday, May 11—The Tavern, Gloucester. Annual Meeting. Speaker to be announced.

NORTH SHORE MEDICAL FRATERNITY

DR. RAPHAEL ISAACS of the Huntington Memorial Hospital addressed the members of the North Shore Medical Fraternity on Tuesday evening, November 3, 1925. He read a paper on "Diseases of the Blood and Blood-making Organs," which was illustrated with stereopticon slides.

LAWRENCE GENERAL HOSPITAL

A CLINICAL staff meeting was held Tuesday, Nov. 10, 1925, at 8.30 P. M. Cases of Meniere's disease, acute indocarditis, hemorrhage into spinal canal were presented.

VICTOR A. REED, M.D., *Chairman.*
R. C. NORRIS, M.D., *Secretary.*

BRISTOL SOUTH DISTRICT

THE semi-annual meeting of the Bristol South District was held in the New Bedford Hotel, New Bedford, on Thursday, November 5.

The committee on subject and speaker departed from the usual custom of selecting a member of the Medical profession, and invited the Hon. Hugo A. Dubuque, Judge of Superior Court, to speak on "The Medical Witness."

The remarks of the speaker were listened to

with keen interest, and the hearty approval at the close, was ample evidence that the committee had satisfied the members present by their selection.

One of our own members who has been signally honored by being chosen Surgeon General of the Grand Army of the Republic, Dr. John Gilbert of Fall River, was then introduced. He received most generous applause.

Attendance 75.

GEORGE E. BORDEN, *Secretary.*

REPORT ON MEETING OF HARVARD MEDICAL SOCIETY

THE Harvard Medical Society met at the Peter Bent Brigham Hospital on the evening of Oct. 27th.

Two cases were demonstrated. The first was a Jewish woman whose chief complaints were shortness of breath and epigastric discomfort. Physical examination showed an enlarged heart with a loud blowing systolic murmur. The heart rate was very slow. The electrocardiogram showed a constant variation in the position of the P-wave. There was later a change to a sino-auricular block which has continued. The case represents an unusual manifestation of rheumatic injury to heart muscle. It is very rare to get a persistent model rhythm as occurred in this case.

The second case was a man of forty-four years who complained of dull gnawing epigastric pain. He had a history of luetic infection and the spinal fluid Wassermann was strongly positive. Since 1923 he has had continuous syphilitic treatment. Last March one testicle was removed because of abscesses. His present trouble began last June. He has vomited during the attacks, but never blood. The stools showed a positive benzidine test, one was a so-called tarry stool. His pain was definitely relieved by food and alkali. The diagnosis lay between duodenal ulcer and pain referable to the content nervous system lues.

Dr. C. K. Drinker addressed the meeting on "Direct Observations on the Heart." During the past six years Dr. Drinker and a number of other investigators have been studying the mammalian heart experimentally often found in patients. By exposing the cat's heart through the chest wall and a slit in the pericardium, they were able to suture the pericardium to the edges of the wound, thus keeping the pleural cavities air tight and allowing normal breathing. With this preparation they could measure changes in the vital capacity of the lungs. By clamping the aorta or constricting the pulmonary veins, they produced passive congestion of the lungs. The effect of increased resistance in the pulmonary veins resembled closely the condition in a decompensated case of mitral stenosis. With a device attached to the trachea, the variations in the amount of air received by the lungs could be measured, as the ligature on the pulmonary veins was tightened and loosened. There was a marked and almost immediate change in the vital capacity when the veins were constricted.

Previously, the pressure in the pulmonary circuit had not been studied, except under very abnormal conditions. With a specially devised cannula which could be inserted as a needle into the pulmonary artery, they were able to make direct readings of the pressure while during normal respirations. The cannula caused no encroachment on the pulmonary flow. They studied variations in the pressure on clamping the pulmonary veins. The pulmonary arterial pressure increased from 17 mm. to 50 mm. As the clamp is made very tight, this high pressure is not sustained. The systemic pressure becomes very low also. This is due to an interference with the coronary blood flow and the nutrition of the heart. The heart begins to fail and the condition simulates a decompensated cardiac case. Releasing the clamp gradually, there is an improvement resembling a compensated mitral stenosis.

Obstruction in the pulmonary arterial path causes heart failure with surprising abruptness. Various degrees of occlusion could be read on the clamp. Fifty per cent occlusion did not disturb the animal much. When the degree of occlusion slightly exceeds sixty per cent there is a sudden break. This would indicate that the heart has a wide margin of safety but that it fails suddenly when the strain gets beyond a certain point.

With the Knowlton and Starling apparatus, the systemic circulation may be side-tracked into a system of tubes and reservoirs. Under these conditions only the heart and lungs of the animal are supplied with circulating blood. The total blood volume can be measured, also the amount in the outside system. Subtracting these the amount of blood in the lungs is obtained. Thus, by increasing resistance in the outside system, congestion was produced in the lungs and the amount of congestion was actually measured. It was found that the volume of blood held by the lungs could be increased four or five hundred per cent.

In the discussion which followed Dr. Christian suggested that this line of investigation might be an excellent field in which to widen our knowledge of the action of various circulatory drugs, especially their action on the coronary circulation, which could be observed directly.

SOCIETY MEETINGS

DISTRICT MEDICAL SOCIETIES

Essex North District Medical Society

January 6, 1926—The semi-annual meeting at Haverhill.
May 5, 1926—The annual meeting at Lawrence.

Middlesex East District Society

January 13—At the Harvard Club at 6:30 P. M. Address by Dr. Richard Ohler, "Metabolism."
February 10—At the Harvard Club. Address by Dr. William F. Boos; subject, "Industrial Poisoning."

April 14—At the Harvard Club at 6:30 P. M. Address by Dr. William E. Ladd, subject to be announced later.
May—Annual meeting, Colonial Inn, North Reading. Subject and speaker to be announced.

Suffolk District Medical Society

November 18—Boston Medical Library at 8:15 P. M. Surgical Section. "Industrial Surgery," by W. S. O'Neill Sherman of Bethlehem Steel Works.
January 6—At 8:15 P. M. Medical Section (meeting postponed from December). Dr. W. J. MacDonald will speak on "Experimental Work in High Blood Pressure."
January 27—At 8:15 P. M. Combined meeting with Boston Medical Library. "Medical Experience of an Explorer," Dr. J. Hamilton Rice.
February 24—At 8:15 P. M. Surgical Section. "Post-operative Care of Surgical Cases," Dr. Dean Lewis, Chicago. "Surgical Convalescence," by Dr. John Bryant.
March 31—At 8:15 P. M. Medical Section. Subject to be announced later.
April 28—At 8:15 P. M. Annual meeting. Election of officers. "Some Diagnostic, Prognostic and Therapeutic Aspects of Disorders of the Blood," Drs. George R. Minot, Cyrus C. Sturgis and Raphael Isaacs.

Notices of meetings must reach the JOURNAL office on the Friday preceding the date of issue in which they are to appear.

BOOK REVIEWS

Preventative Medicine. By MARK F. BOYD, M.D., M.S., C.P.H. Member Regular Field Staff, International Health Board of the Rockefeller Foundation: formerly Professor of Bacteriology and Preventative Medicine in the Medical Department of the University of Texas. Second Edition revised, Philadelphia and London. W. B. Saunders Company. 1925.

In the thirty-seven chapters of this book of about 400 pages, the author considers briefly almost every subject which we have come to consider as a matter related to public health. Even industrial hygiene eugenics and maritime quarantine have not been omitted. The author's consideration of any one subject is necessarily brief.

A wider practical experience might perhaps have led him to lay more emphasis on certain matters, as, for example, the necessity for isolation at the beginning of infectivity in efforts to control communicable diseases and to attach greater importance to contaminated hands and eating and drinking utensils in spreading such diseases. But whatever may be said in the way of criticism of this sort the author treats in a careful and scholarly manner everything he has undertaken to consider. It is seldom indeed that one sees in a book relating to public health such evidence of painstaking care with respect to the arrangement and presentation of the subject matter. Conciseness of language has enabled the author to give an enormous amount of information within the limits of the book and the list of references at the end of each chapter adds greatly to its value. The book would seem to be especially well adapted for use as a text-book in connection with lectures or for reference.

Neurological Fragments. By J. HUGHLINGS JACKSON, M.D., with Biographical Memoir by James Taylor and including the "Recollections" of the Late Sir Jonathan Hutchinson and the late Dr. Charles Mercier. Oxford University Press, London, 1925.

These "fragments" of Hughlings Jackson (1835-1911) appeared in the *Lancet*, at varying intervals over a period of sixteen years, and deal with points of clinical and physiological interest to neurologists. They are now brought together in convenient form, with a number of other papers and a complete bibliography of Dr. Jackson's writings. The "fragments" consist of twenty-one short papers on a great variety of subjects, with many brief case reports. Some of the papers may appear rather trite to the present generation, for they deal with matters of common, every-day interest, illustrated over and over again in our neurological clinics. It must be remembered, however, that it is only because of such men as Jackson, with his discerning vision and meticulous examinations, that the more fundamental reflex actions of the spinal cord and brain as we now use them in clinical diagnosis are familiar to us. Hughlings Jackson put down some of our most important foundation stones of structural neurology and many of them are to be found in these "fragments." The volume also contains a concise biography by James Taylor, and sympathetic notes by Jonathan Hutchinson and Mercier. The book will be of great interest to neurologists and others, for it serves to recall to our mind a man who ought not to be forgotten, for, as Hutchinson says, he "approached more nearly to what we call genius than almost any of his contemporaries."

Handbook of Diagnosis—The Heart. By DR. ROBERT H. NICHOLS.

This very short treatise covers the clinical aspects of heart disease and is written by one who has to a large extent been interested in osteopathy. It is not clear whether Dr. Nichols has had an early medical training or not. Written by an osteopath, the book indicates a very sound point of view of a fairly complicated clinical problem. It is simply expressed and can exercise a wholesome and beneficial influence on osteopathic practitioners, for there is much in it they need to know. On the other hand, for those physicians who are already somewhat familiar with the problems of heart disease, there is little in it of value. To the latter it will be obvious that here and there points of view expressed are questionable and have little of authority to support them.

The evidence, for example, of the recovery of a case of malignant endocarditis cited on Page 48 is very meagre. Likewise the following: "The above title, 'Mitral Disease,' indicates a specific infection with the streptococcus viridans occurring as acute, or recurring as chronic endocarditis, on the mitral valve flaps . . . . ." The specific bacteriologic cause of mitral stenosis is still unknown and cannot be so readily

dismissed. Dr. Nichols' viewpoint that "mitral stenosis, or any other form of heart disease, has a fixed pathology which cannot be cured by osteopathic or any other treatment" is much nearer the truth.

This volume ought to help a great deal in teaching osteopathic practitioners an important subject about which their ordinary training probably has given them insufficient information. It is a most worthy effort to enlighten osteopaths.

The Inheritance of Mental Diseases. By ABRAHAM MYERSON, M.D. Williams and Wilkins Co., Baltimore, Md., 1925. Pp. 336.

The subject of heredity in mental diseases has been a particularly difficult problem for psychiatry, partly because of the loose manner in which the term has been used and partly because we do not know exactly what is inherited, the particular disease as an entity or a so-called predisposition. Furthermore, the word "heredity" inspires more terrors in the popular mind than the actual mental disease itself. This volume is particularly concerned with a discussion of the transmission of mental diseases, commonly called the inheritance of insanity and its contents show a healthy reaction from the loose thinking and pseudo-scientific conclusions of the eugenists. The general practitioner and the specialist in psychiatry, will find here a convenient summary of the various clinical and biological ideas on heredity, which have heretofore been scattered in various publications, reinforced by the author's own clinical experience and investigations.

Beginning with an account of the most important mental diseases, there is discussed in turn some psychiatric material which the author personally investigated, the various biological and psychiatrical theories of mental diseases and finally what is termed the vertical and horizontal transmission of specific mental disorders. Vertical transmission is defined as transmission from one generation to another and horizontal transmission as the appearance of certain mental diseases in the members of the same generation. In vertical transmission, the chief problem of clinical investigation is,—that, given a certain type of mental disease in an ancestor, what form of mental disease is to be expected in his direct insane descendants. The conclusions given (pp. 222-223) are too long to be inserted within the limits of a review. The conclusions on horizontal transmission, that is, what forms of mental disease can be expected in the family group of the same generation, are summarized on p. 269.

However, there is one important omission in all this discussion, namely, the question of identification or the emotional tie of one person with another, for it is these emotional ties which may produce identical mental disturbances, particularly of the benign type, in members of the same family and unless they are clearly understood, they are apt to be superficially labelled as "heredity."

The biological theories of heredity are next discussed, such as polymorphism, Mendelism and Weismannism. The author is adversely critical of the Mendelian laws in the transmission and heredity of mental dieases, although admitting the value of these laws in botany and zoölogy. The attitude to Weismannism is less critical, for it is shown that the germ plasm of an individual can be so altered and injured by environmental influence, so as to alter and injure his posterity for several generations. The author concludes, that the hereditary transmission of mental disease is a problem of psychiatry, to be attacked in the main by clinical and experimental methods and only when we have sufficiently accurate data, can laws be formulated by statisticians and biometricians.

The volume has certain weak points, such as the use of the term "psychasthenia" which is no more of a clinical entity than "neurasthenia" and the statement, attributed to Janet, that hysteria is due to a lowered psychological tension instead of a dissociation of consciousness. Furthermore there are contradictions, for instance, the criticism of the psychoanalytic interpretation of schizophrenia, while at the same time expressing admiration for Bleuler's epoch-making work on this disease, which is purely a psychogenetic approach. For it is Bleuler's interpretative work on the psychoses, which has illuminated psychiatry and emancipated it from the sterile description of symptoms as developed by Kraepelin. Finally there may be mentioned the omission in the bibliography of any reference to Bleuler's important work on Mendelism in the psychoses, and the use of the word "vereistis" instead of dereistic thinking of schizophrenia, the latter probably a misprint.

Clinical Laboratory Medicine. By HENRY M. FEINBLATT AND ARNOLD H. EGGERTH. William Wood and Company. pp. 424.

The field of clinical laboratory methods is so well covered by the various manuals now in common use that another would seem hardly necessary. However, this volume will be of real value in that it includes all of the procedures that the laboratory worker is ordinarily called upon to do, from the making of bacteriological media and histological preparations to liver function tests. In spite of the wide range covered, wise selection of methods has prevented it from being of unwieldly size. Many of the illustrations are excellent, particularly the two colored plates showing blood cells and malarial parasites. A valuable feature is the emphasis on clinical interpretation of laboratory results. The frequent breaks in continuity of the text caused by the interpolation of references form a somewhat annoying feature.

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ORIGINAL ARTICLES

CHEMICAL STUDIES OF THE BLOOD IN PNEUMONIA

I. A Method of Constructing an Alignment Diagram to Represent Changes in the Gaseous Composition of the Blood and Changes in the Electrolyte Concentration of the Plasma.*

BY THOMAS E. BUCKMAN, A.M., M.D., F. DENNETTE ADAMS, M.D., MILLARD SMITH, M.D., AND H. T. EDWARDS, BOSTON

SINCE the work of Barcroft[1] in 1913 on the oxygen dissociation curve of the blood there has been a rapid development of our knowledge concerning the respiratory mechanism. The early work of Barcroft, of Bohr[2] and of Krogh[3] has been followed by the investigations of Christiansen, Douglas and Haldane[4], Hasselbalch[5], Parsons[6], Peters[7], Fridericia[8], L. J. Henderson[9], Y. Henderson[10], Lundsgaard[11], Van Slyke[12] and others all contributing to the general problem of the physico-chemical system of the blood. Y. Henderson and Haggard[13] in 1919 first attempted to bring together, graphically as many of the factors as were then accurately known in the form of their carbon dioxide diagram of the blood. At that time, however, the effect of oxygenation of the blood upon the carbon dioxide exchange was not fully appreciated and it remained for L. J. Henderson to describe the mechanism by which carbon dioxide is driven off in the process of oxidation and to demonstrate how the several factors,—hydrogen-ion concentration, percentage oxygen saturation, oxygen and carbon dioxide tensions, bicarbonate and chloride concentrations,—could be grouped as interrelated factors of a physico-chemical system and represented graphically by means of an alignment diagram or nomogram.

More recently, Bock, Field and Adair[14] have determined with great accuracy the carbon dioxide dissociation curves of the blood laying part of the foundation for the paper by Henderson, Bock, Field and Stoddard[15]. In this latter publication additional data are presented and from a consideration of these, and the data presented by Van Slyke, Wu and McLean[16] a nomogram of the blood is constructed showing the changes which may occur at all parts of the arterio-venous cycle.

It might seem superfluous, after these publications, to present still another method of constructing alignment diagrams of the blood. Our reason for so doing is that we believe that the methods here detailed are in some respects simpler than those hitherto described and represent variations which may have particular usefulness in the study of special conditions. Moreover, one of the diagrams here presented retains a desirable feature of the original Henderson-Haggard diagram, namely, the shape of the carbon dioxide dissociation curve which could be apprehended only vaguely from inspection of the alignment diagrams hitherto published.

PROCEDURE

Analyses of blood for carbon dioxide and oxygen were made with the apparatus and according to the method described by Van Slyke[17]. The sodium chloride content of the blood was determined by the method of Smith[18]. Since the analyses here reported were carried out a very much more accurate method for blood gas analysis has been described by Van Slyke[19] wherein an apparatus is used in which the volume of gas is maintained constant. Although our data are undoubtedly less accurate than those presented in very recent papers and though many discrepancies are obvious we believe, nevertheless, that the values obtained are sufficiently accurate to show the essential truth of the propositions which we wish to demonstrate. Following is the general description of the plan followed in collecting the data for determining the fundamental relationships on which the nomogram is based.

Specimens of oxalated blood were nearly deprived of oxygen by subjecting them to an atmosphere of carbon dioxide. This procedure was adopted because in practice it is very dif-

*From the Department of Pediatrics of the Harvard Medical School and the Pediatric Service and the Blood Laboratory of the Boston City Hospital. This is publication No. 57 of a series of studies on metabolism from the Harvard Medical School and allied hospitals. The expenses of this research were in part defrayed by a grant from the Proctor Fund of Harvard University for the study of chronic disease.

ficult to secure consistent results by starting with fully oxygenated blood and then simply lowering the oxygen tension of the atmosphere. It is necessary to start with reduced blood and, maintaining the carbon dioxide tension constant, gradually to increase the tension of oxygen to which the blood is exposed. Accordingly, specimens of reduced blood in rotating cylinders were exposed to certain tensions of carbon dioxide and oxygen for a period of twenty minutes at 37°C. The tensions of carbon dioxide used were such as to yield data showing the influence of increasing oxygen tension on blood maintained at a constant carbon dioxide tension. The actual tensions maintained are stated in Table I.

TABLE I

OXYGEN DISSOCIATION OF HEMOGLOBIN
(Percent Oxyhemoglobin)

Oxygen Tension (m.m.Hg)	Carbon Dioxide Tension (m.m.Hg)			
	20	40	70	140
10	26.3	20.8	24.4	22.9
20	48.5			20.5
30	82.1	65.6	48.3	40.6
40	89.3	75.3		
50	90.4	85.1	72.6	70.5
60	88.6			
70	94.5	89.4	86.0	79.0
80				
90	93.1		90.1	92.0
100	94.1	93.5		
110	94.4		91.4	91.3
130				92.9
145			94.3	
151		95.7		
155	96.6			

In particular, a given sample of freshly drawn venous blood, after reduction, was divided into three parts. One of these was exposed to atmospheric air. A second part of the sample was exposed simultaneously to an atmosphere in which the tension of carbon dioxide was, for example, 20 mm. Hg and the oxygen tension 10 mm. Hg. At the same time the third part of the sample was exposed to an atmosphere in which the tension of carbon dioxide was 20 mm. Hg and the tension of oxygen 155 mm. Hg.* After equilibration the first

*If the carbon dioxide tension were 40 mm. Hg, the oxygen tension was made 145 mm. Hg, and if the carbon dioxide tension were 70 mm. Hg, the oxygen tension was made 145 mm. Hg. Finally, if the carbon dioxide tension were 140 mm. Hg, the oxygen tension was made 130 mm. Hg. This variation was introduced in order to make the values in the fundamental series of curves correspond with those obtained in the study of a particular case. In obtaining the carbon dioxide dissociation curve of the blood of a given patient it was our practice to subject the blood to tensions of carbon dioxide of 20, 40 and 70 mm. Hg by allowing a known volume of carbon dioxide to displace an equal volume of atmospheric air from the tonometer. This procedure caused, of course, a diminution of the oxygen tension in the air of the tonometer and at a barometric pressure of 760 mm. Hg the oxygen tensions would have values equal to those assigned above.

sample was analyzed for its content of sodium chloride and of oxygen. The latter represented the oxygen combining capacity of the blood. A part of the second part of the sample was analyzed for its contents of oxygen and carbon dioxide as well as sodium chloride. Another part of this second specimen was centrifugalized under oil and the plasma so obtained analyzed for its contents of sodium chloride and carbon dioxide. Similarly, an analysis was made of the third part of the original sample of reduced blood. From these data the oxygen dissociation curves (Chart I) were drawn as well as the graphs representing the percentage change in carbon dioxide content of the plasma (Chart II) and the whole blood (Chart III) and the percentage change in the sodium chloride content of the plasma (Chart IV) with changes in the percentage saturation of the whole blood with oxygen.

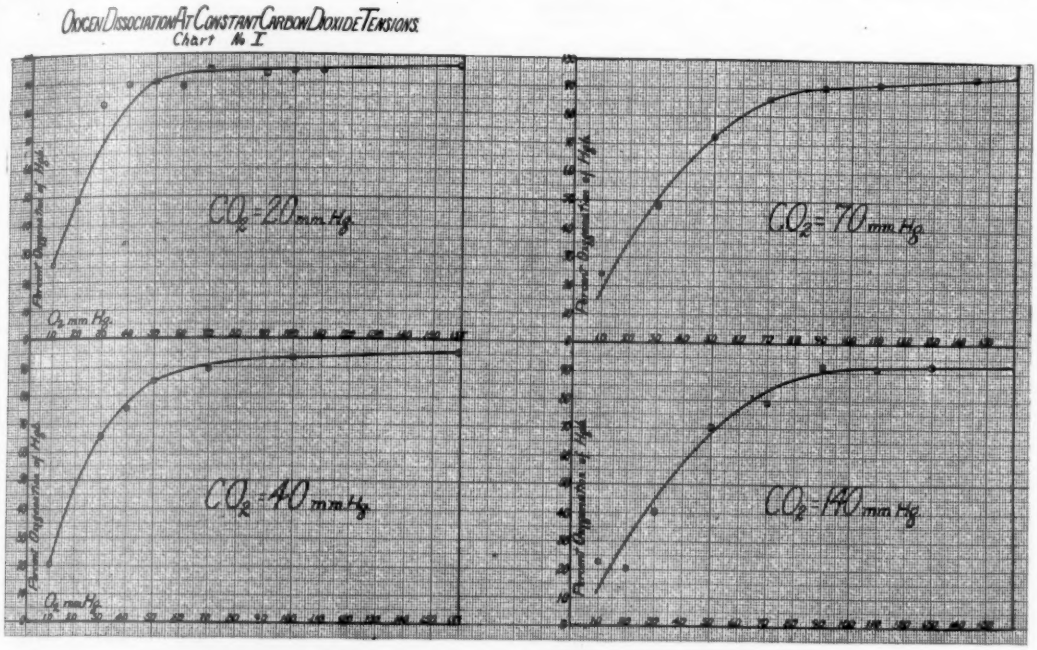


TABLE II

Percentage Increase in Plasma CO_2 Content with Decrease in Percentage $HgbO_2$ at CO_2 Tensions of 20, 40, 70, and 140 m.m. Hg.

20 m.m. CO_2		40 m.m. CO_2		70 m.m. CO_2		140 m.m. CO_2	
percentage $HgbO_2$	percentage CO_2 increase	percentage $HgbO_2$	percentage CO_2 increase	percentage $HgbO_2$	percentage CO_2 increase	percentage $HgbO_2$	percentage CO_2 increase
26.5	3.3	31.9	4.3	35.0	4.4	22.5	5.1
88.8	2.9	68.1	3.8	64.7	3.6	65.6	4.1
96.5	0.8	85.4	2.9	87.5	2.4	80.6	2.9
96.6	0.0	88.4	1.9	91.4	1.2	86.7	1.4
		96.4	0.8	94.3	0.0	92.9	0.0
		95.7	0.0				

Several blood specimens were subjected to each of the tensions of carbon dioxide and oxygen indicated in Table I, the number varying from three to seventeen and depending upon

the closeness with which the analytical results agreed with one another. Inasmuch as several hundred analyses were made the results from individual specimens are not here presented but the mean values are shown in Tables I, II, III and IV.

In Table I are recorded the mean values for the percentage saturation of the blood with oxygen at fixed tensions of carbon dioxide and at increasing oxygen tensions. From these data the oxygen dissociation curves of Chart I were constructed. In Table II the mean percentage increase of the carbon dioxide content of the plasma corresponding to a given mean percentage decrease in the percentage saturation of the blood with oxygen at a given carbon dioxide tension is shown. Similarly, in Table III the mean percentage increase in the carbon dioxide content of the whole blood corresponding to a given mean percentage decrease in the percentage saturation of the blood with oxygen at a fixed carbon dioxide tension is shown. These results are represented graphically in Charts II and III. In each instance, for the purpose of calculating percentage changes the value of 100 was assigned to the carbon dioxide

Percentage Increase Of Plasma CO_2 Content Corresponding To The Decrease Of Percent O_2 Saturation Of The Whole Blood At Constant CO_2 Tensions.

Chart II.

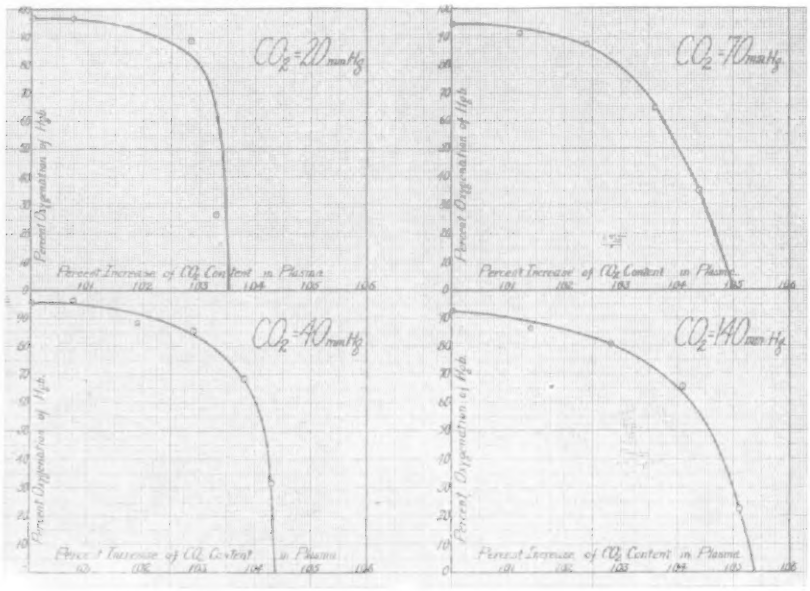


TABLE III

Percentage Increase in Whole Blood CO_2 Content with Decrease in Percentage $HgbO_2$ at CO_2 Tensions of 20, 40, 70, and 140 m.m. Hg.

20 m.m. CO_2		40 m.m. CO_2		70 m.m. CO_2		140 m.m. CO_2	
Percentage $HgbO_2$	Percentage CO_2 increase	Percentage $HgbO_2$	Percentage CO_2 increase	Percentage $HgbO_2$	Percentage CO_2 increase	Percentage $HgbO_2$	Percentage CO_2 increase
28.3	4.9	28.5	5.3	33.1	8.5	27.9	7.2
83.5	3.8	85.7	2.8	82.3	4.0	74.3	4.8
89.4	1.3	92.5	1.1	85.9	1.4	92.9	0.0
96.6	0.0	95.7	0.0	88.0	2.6		
				91.6	0.4		
				94.3	0.0		

content of the blood exposed to a given tension of carbon dioxide and the maximal oxygen tension used at that tension of carbon dioxide (third part of original sample of blood).

In Table IV are shown the percentage changes in the sodium chloride content of the plasma corresponding to percentage changes in the carbon dioxide content of the plasma and these relationships are represented in the graph of Chart IV.

Percentage Increase In Whole Blood CO_2 Content Corresponding To The Decrease Of Percent O_2 Saturation Of The Whole Blood At Constant CO_2 Tensions
Chart III.

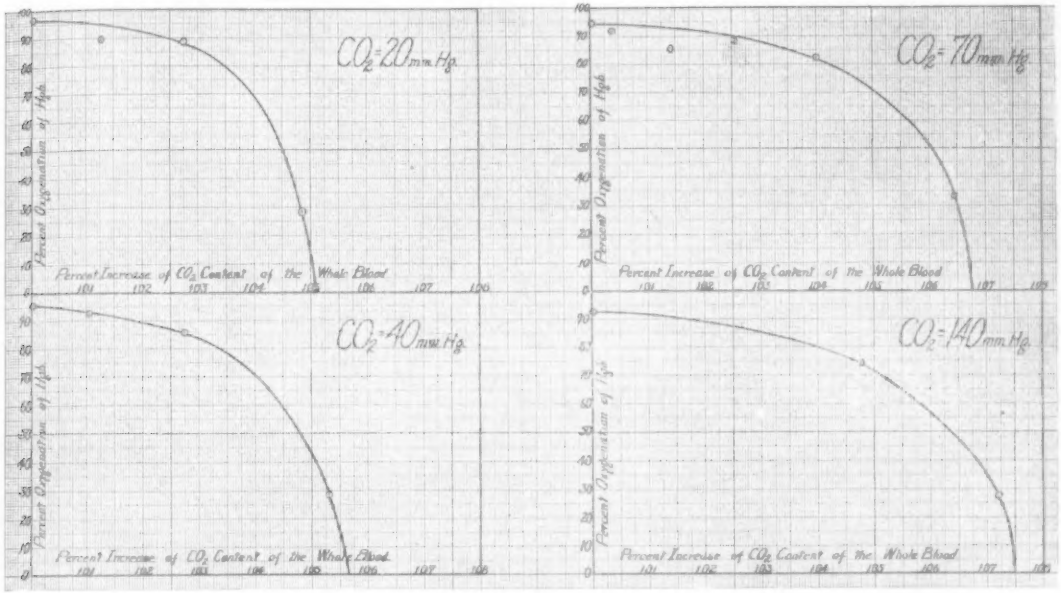

CO_2=20 mm. Hg.
CO_2=70 mm. Hg.
CO_2=40 mm. Hg.
CO_2=140 mm. Hg.
Percent Oxygenation of Hgb.
Percent Increase of CO_2 Content of the Whole Blood

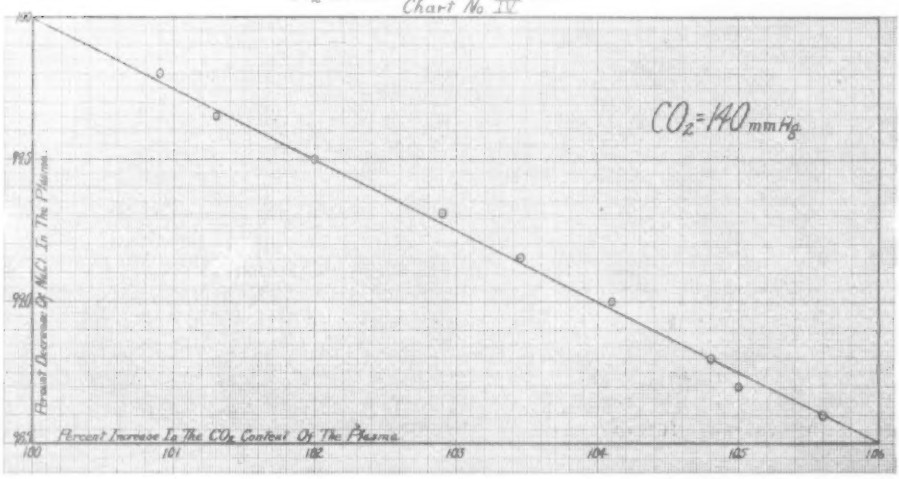
TABLE IV

PERCENTAGE DECREASE IN PLASMA NaCl WITH PERCENTAGE INCREASE IN PLASMA CO_2

Percentage CO_2 increase	Percentage NaCl decrease
0.9	0.2
1.3	0.3
2.0	0.5
2.9	0.7
3.5	0.8
4.1	1.0
4.8	1.2
5.0	1.3
5.6	1.4

Since the percentage increase in the carbon dioxide content of the plasma corresponding to a given diminution of oxygen saturation of the whole blood has been determined (Table II) and since the relationship between the percentage increase in the plasma carbon dioxide content and the percentage decrease in the plasma sodium chloride content has also been computed (Table IV), it is possible so to align these values that the relation between percentage changes in the plasma content of sodium chlor-

Percent Decrease Of NaCl In The Plasma Corresponding To The Percent Increase Of CO_2 Content Of The Plasma.
Chart No. IV.



ide and changes in the percentage saturation of the blood with oxygen can be evaluated (Table V). It is now possible to represent simultaneously the percentage saturation of the whole blood with oxygen at a given tension of carbon dioxide as a function of the following variables:

(a) Oxygen Tension.
(b) Percentage increase in plasma carbon dioxide content.
(c) Percentage increase in whole blood carbon dioxide content.
(d) Percentage decrease in plasma sodium chloride content.

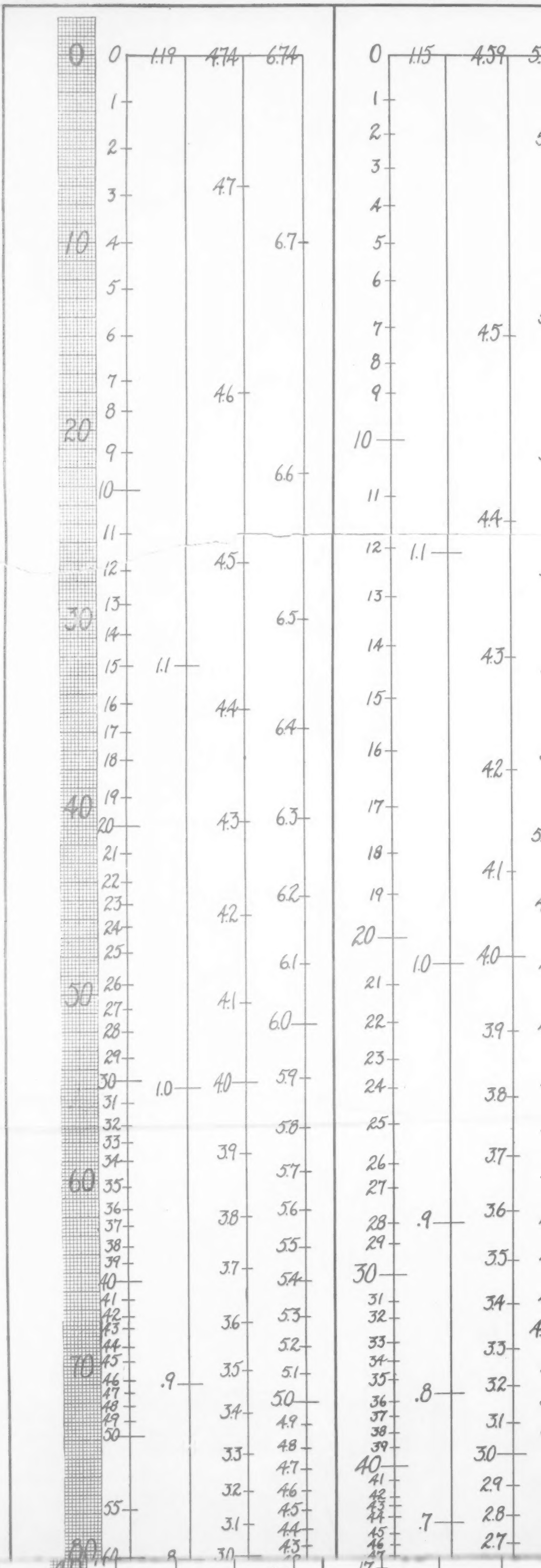
The representation of these simultaneous relationships are shown in the graphs of Charts V, VI, VII and VIII. From these graphs, by interpolating values at short intervals, the results recorded in Tables VI, VII, VIII and IX were obtained. From these values, Chart IX was constructed. This chart, or nomogram, is really merely a rectification of the graphs of Charts V, VI, VII and VIII. From it, there may be readily ascertained, for a given percentage saturation of the blood at a given tension of carbon dioxide, the change in the oxygen tension, the percentage increase in the car-

TABLE V

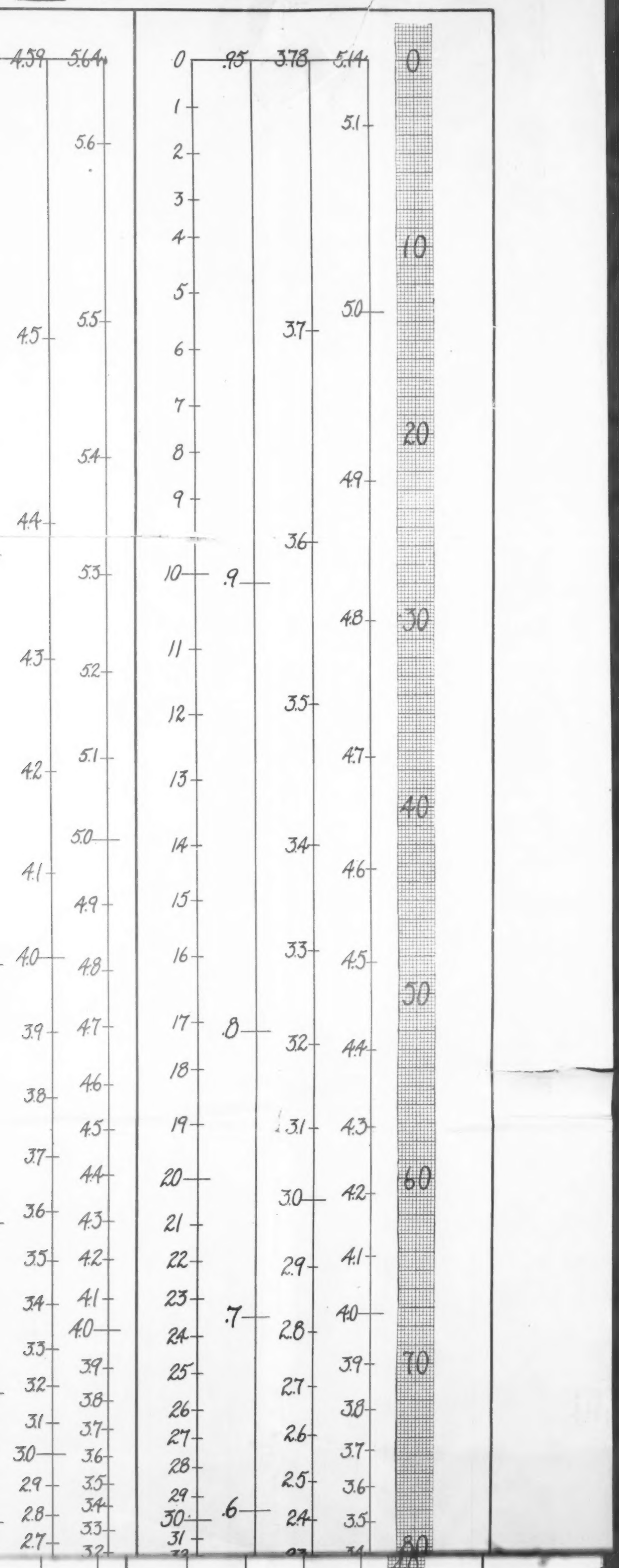
PERCENTAGE DECREASE IN PLASMA NaCl COMPARED WITH PERCENTAGE OXYGENATION OF WHOLE BLOOD OBTAINED BY COMBINING TABLES II AND IV

CO_2 tension m.m. Hg	percentage increase in Plasma CO_2	percentage decrease in Plasma NaCl	percentage $HgbO_2$
20	0.0	0.0	96.6
	1.0	0.25	95.3
	2.0	0.50	85.7
	3.0	0.75	61.3
	3.5	0.88	34.8
	3.78	0.946	0.0
40	0.0	0.0	95.7
	1.0	0.25	93.4
	2.0	0.50	87.6
	3.0	0.75	75.3
	4.0	1.00	48.3
	4.5	1.13	13.8
	4.6	1.15	0.0
70	0.0	0.0	94.3
	1.0	0.25	93.5
	2.0	0.50	90.4
	3.0	0.75	80.4
	4.0	1.00	54.7
	4.5	1.12	27.3
	4.74	1.19	0.0
140	0.0	0.0	92.9
	1.0	0.25	90.0
	2.0	0.50	85.9
	3.0	0.75	79.5
	4.0	1.00	67.3
	4.5	1.12	56.5
	5.0	1.25	36.8
	5.35	1.34	0.0

CHART IX


0 1.19 4.74 6.74
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 55 60
4.7 6.7 4.6 6.6 4.5 6.5 1.1 4.4 6.4 4.3 6.3 4.2 6.2 6.1 4.1 6.0 1.0 4.0 5.9 5.8 3.9 5.7 3.8 5.6 5.5 3.7 5.4 5.3 3.6 5.2 5.1 .9 3.5 5.0 4.9 4.8 3.4 4.7 4.6 3.3 4.5 3.2 4.4 3.1 4.3 .8 3.0
0 1.15 4.59
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47
4.5 4.4 1.1 4.3 4.2 4.1 1.0 4.0 3.9 3.8 3.7 .9 3.6 3.5 3.4 3.3 .8 3.2 3.1 3.0 2.9 .7 2.8 2.7

IX


4.59
5.64
0
.95
3.78
5.14
0
1
5.1
5.6
2
3
4
10
5
5.0
5.5
4.5
3.7
6
7
20
5.4
8
4.9
9
4.4
3.6
5.3
10
.9
4.8
30
4.3
11
5.2
3.5
12
5.1
4.7
4.2
13
40
5.0
14
3.4
4.6
4.1
4.9
15
3.3
4.5
4.0
4.8
16
50
17
.8
3.9
4.7
3.2
4.4
18
4.6
3.8
19
3.1
4.3
4.5
3.7
20
4.4
60
3.0
4.2
3.6
4.3
21
22
2.9
4.1
3.5
4.2
23
.7
4.0
3.4
4.1
2.8
24
4.0
3.3
3.9
25
70
2.7
3.2
3.8
26
3.8
3.1
3.7
27
2.6
3.7
3.0
3.6
28
2.5
3.6
2.9
3.5
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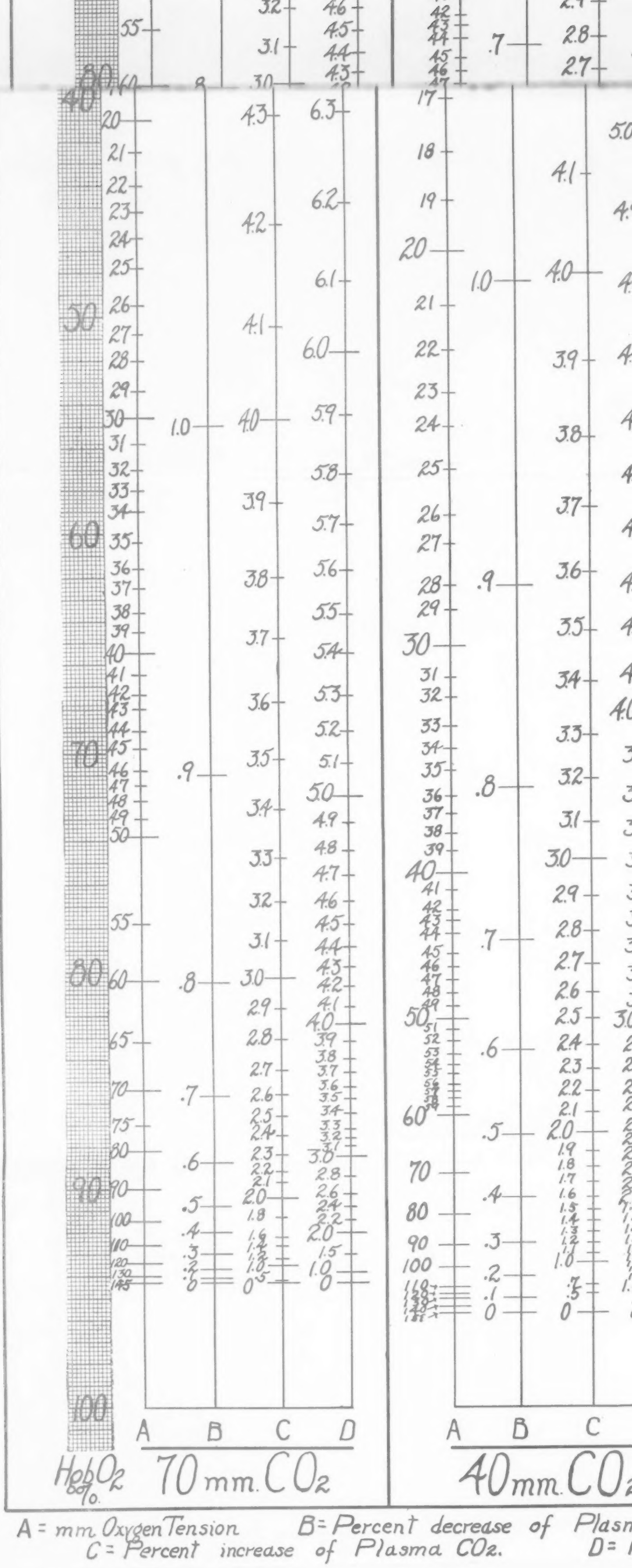
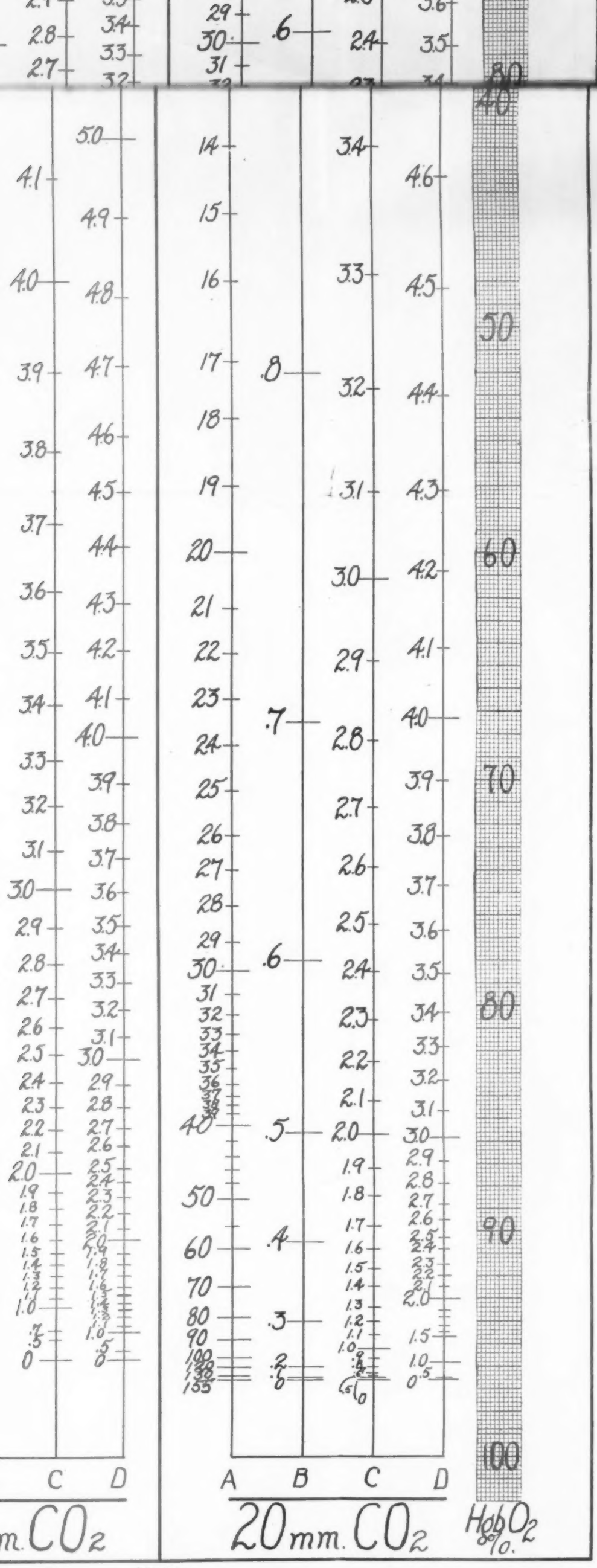
31
3.2
80
40



A = mm. Oxygen Tension B = Percent decrease of Plasm
C = Percent increase of Plasma CO_2. D =



f Plasma NaCl
D = Percent increase of Whole Blood CO2.